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ABSTRACT

This program contains four training modules on the development and use of the education management information system. It is designed primarily for planners and administrators at the provincial level in Indonesia, who are responsible for collecting, processing, and analyzing statistics for educational planning and management. The purpose of the program is to facilitate the use of microcomputers to increase the speed of access, flexibility, and versatility of this information. The training modules cover the basic framework of an integrated management information system, demonstrate setting up and using a system, show how interactive models can be developed on microcomputers, and illustrate how computer systems can be modified to cope with changes using readily-available, user-friendly software. Modules I-IV cover basic concepts and computer applications to educational planning management, development of the educational management information system, use of the management information system for management control, and use of the management information system for education planning. (JPT)

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EPP

# EDUCATIONAL POLICY AND PLANNING PROJECT

A GOVERNMENT OF INDONESIA - USAID PROJECT

# INDONESIA

## Microcomputer Applications for Education Planning and Management: A Modular Training Program

MODULES I - IV

U.S. DEPARTMENT OF EDUCATION
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Office of Educational and Cultural Research and Development
MINISTRY OF EDUCATION AND CULTURE

Jakarta, Indonesia

EPP

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## Microcomputer Applications for Education Planning and Management: A Modular Training Program

**MODULE I**

**Basic Concepts and Computer Applications to Educational Planning and Management**


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## PREFACE

The Educational Policy and Planning (EPP) Project is a seven year project conducted jointly by the Indonesia Ministry of Education (MOEC) and the United States Agency for International Development (USAID). The overall project objective is to improve the quality of education in Indonesia by assisting the MOEC, through the Office of Educational and Cultural Research and Development (Balitbang Dikbud), to formulate better policies and long-term plans. The project aims to improve policy formulation and long-term planning by improving the timeliness, relevance and accuracy of educational data collection, the subsequent analyses of such data, and their ultimate use for policy and decisionmaking.

There are three major components of the EPP Project: (1) development of an integrated management informations system (MIS) within the MOEC, (2) enhancement of MOEC policy research and analysis capacity, and (3) support for MOEC institutional development at the national and provincial level through training and technical assistance. EPP technical advisory staff work closely with counterpart Indonesian staff as part of a collaborative process of developing institutional capacity.

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Head, Center for Informatics
Office of Educational and Cultural Research and Development
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Republic of Indonesia

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The EPP Project in collaboration with the USAID Improving the Efficiency of Educational Systems (IEES) Project, publishes EPP documents in order to disseminate this knowledge and extend its usefulness. EPP has carried out a series of policy studies designed to provide answers to key questions facing Indonesian educators. These include:

The Quality of Basic Education
The Quality and Efficiency of Vocational/Technical Education
The Strengthening of Local Education Capacity
Developing Indicators of Educational Efficiency
Teacher Education Issues
Curriculum Reform and Textbook Production
Education, Economic, and Social Development

This series has been planned under the direction of Moegiadi, Balitbang Dikbud, and Boediono, Center for Informatics, Balitbang Dikbud and Simon Ju, EPP Chief of Party.

Editors for the series are Abas Gozali, Reta Hendrati Dewi, Center for Informatics, and Jerry Messec, IEES, Florida State University.

# INTRODUCTION TO EPP TRAINING MODULES ON THE DEVELOPMENT & USE OF MIS ON MICROCOMPUTERS

## 1.0 Purposes

1.1 These training modules on the development and use of the education management information system are primarily designed for planners and administrators at the provincial level, who are responsible for collecting, processing and analyzing statistics for educational planning and management. The main feature of the modules is the use of microcomputers to enhance the speed, flexibility, and versatility in the use of information.

1.2 The purposes of the modules are as follows:

- To introduce to the participants the basic framework of an integrated education management information system which could be used to serve the varied needs of different users;
- To demonstrate how such a system could be set up, making use of microcomputers, and how data could be retrieved for analytical purposes;
- To show how an interactive model(s) for diagnostic, forecasting, planning and budgeting purposes could be developed on microcomputers; and
- To show, as well, how the computer system and the models could easily be modified to cope with unforeseen changes in requirements, with the help of user-friendly software packages abundantly available on the market.

## 2.0 The Hierarchies of Information

2.1 When viewed in terms of the point at which information is collated and used, there are three main levels of information:

- The school level, at which detailed information about individual pupils, teachers and staff (including their name, age, sex, grade, home address, academic performance, qualification, salaries, etc.), as well as information about the schools (e.g., area, number of rooms, equipment, etc.) have to be kept for the smooth running of the schools concerned;
- The district level, where not all the data kept by schools are required. Only summary statistics such as the number of pupils by age, sex and grade, and the amount of recurrent expenditures are required for individual schools; and
- The national level, where, depending on the extent of decentralization, detailed information on individual schools may not be required. Only summary information is collected at the subdistrict or district level.

2.2 Alternatively, depending on the usage, information could be distinguished between that for:

- planning,
- management control, and
- operation.

2.3 Ideally, information at the school, district, and national level should be integrated and shared in one, or one network, of data base(s). For instance, information stored in schools could be computerized, and only the relevant data would be extracted and passed to the computer system kept at the district level;

and the similar procedure could apply to the flow of information between the district and national level. This could help avoid a lot of duplication of work, and solve the problems of quality of data and the time lag in producing the information. With the use of individualized data bases, more accurate information could be made available about pupil and teacher flow, which is extremely useful in planning school location, and teacher demand and supply. The individualized data base could also reduce considerably the data problems confronting educational researchers, especially those engaged in longitudinal studies.

2.4 Similarly, the same can be said of information for planning, management control and operation. For instance, a simple ledger accounting system, if carefully designed and computerized, could provide a wealth of information useful in monitoring spending, analyzing cost structure and efficiency, as well as for forecasting and planning educational expenditures.

2.5 For the purpose of the present training modules, it is not proposed to cover the entire spectrum of the information system as discussed above, which would be clearly beyond the scope of this training program. Attention will mainly be focused on the following:

- The flow of information from schools to the provincial and central offices via the usual channel of school surveys conducted by the Balitbang; and
- The use of such information for planning and administrative purposes at the central as well as provincial level.

Once the participants have mastered the basic principles and techniques discussed in this training program, they should have relatively little difficulties to applying them to different information environments in their daily work.

## 3.0 Organization of the Modules

3.1 There will be four modules in this training program, which are as follows:

- Module I: Overview of basic concepts and computer applications in educational planning, management, and research;
- Module II: The development of the Education Management Information System;
- Module III: The use of the Education Management Information System for management control; and
- Module IV: The use of the Education Management Information System for planning.

## 4.0 The Structure of Instructional/Learning Process

4.1 Much of the emphasis placed in this training program is the use of microcomputers and software packages. Although data base and spreadsheet programs for data files creation and manipulation and modeling have already been designed for the participants, they inevitably have to understand and practice the techniques in the use of microcomputers and software packages. With the availability of many user-friendly software packages and utility programs, computer programming could be kept to a minimum. It is also the aim of this training module to show to the participants that understanding the basic principles and operating system of the various software packages would be sufficient to enable them make full use of the information available to them for planning, management and research. For those participants who have a keen interest in computer programming and in mastering the software package, this training module will prepare them for further improving their computer skills by practicing the techniques demonstrated in this program.

4.2 It is recognized that the design of a management information system should be largely user oriented. It should start by looking at the potential uses of information rather than for the collection of information per se. However, it would be deceptive to assume that all potential uses of information could be foreseen at the time a management information system is constructed. Furthermore, the requirements and practices in educational planning and management in Indonesia vary considerably from province to province. Thus, it is almost impracticable to include the specific requirements of each and every province in designing the training modules.

4.3 Naturally, participants to the training program would come from different divisions of the provincial education offices. Some of them may mainly be concerned with say planning and budgeting, while others in the supervision of schools or other management functions. Some may be involved only in data collection. Consequently, not all parts of the training program would be of equal interest to the participants.

4.4 Taking into account the above considerations, the approach adopted in the design of the training materials is as follows:

- APPLICABILITY is emphasized in the training program. Wherever possible, practical sessions on microcomputer applications are included in the modules so that the participants can have "hands-on" experience in the course. They will also be invited to try to include some of their daily planning, management and research tasks into the practical sessions, making use of some of the techniques and methods discussed in the training program;

- FLEXIBILITY will be introduced in the design of the training materials so that alternate designs and applications of the management information system will be tested during the practical sessions, making full use of the versatility and flexibility of a computerized data base and the computer software packages; and

- a MODULAR approach will be adopted in the course so that each module is as self-contained as possible.

4.5 The structure of the instructional and learning activities for each of the four modules will thus be arranged as follows:

- Overall Objectives of each of the modules will first be stated so that instructors are aware of the while purpose of the module as well as the knowledge which is expected to be imparted during the instructional and learning processes;

- Module Performance Objectives will also be stated to enable the instructors to assess the extent to which the behavior of learners would be changed upon completion of the module. More specific performance objectives will also be given for different instructional units within a module;

- The actual instructional and learning processes are divided into four phases as follows:

  - Instructional activities where the instructors will present to the learners the teaching materials for the module and unit concerned. The teaching materials will cover the basic conceptual issues related to the topic in question, and fundamentals of computer applications that will be demonstrated, highlighting strengths and weaknesses of such applications;

  - User manual where the instructors will carry on with the presentation, but using microcomputers to demonstrate the various applications in planning, management, and research. The detailed step-by-step procedures required to be followed in developing and using the different computer applications will be described in this user manual section. Therefore, this section is designed for both the instructors and the learners;

- Learning activities where the interaction between the instructors and learners will take place. The learners will be asked to:

  - practice the techniques in developing and using the data bases or models demonstrated by the instructors;

  - then the participants will be divided into groups to discuss the concepts, approaches and methods used in the training materials. During the group discussion, they will be asked to suggest alternative approaches to the development and use of the management information system;

  - based on the alternative designs suggested, the learners will, under the guidance of the instructors, actually develop a new management information system and different models of computer applications;

- Post-assessment where the instructors will attempt to evaluate the extent to which the learners have been able to have a firm grasp of the contents of the training materials. A number of questions and assessments have been proposed in the unit, and individual learners will be asked to do the assignments themselves.

## 5.0 Choice of Computer Software Packages

5.1 With the rapid development in computer technology, it is difficult to choose software packages which are both the most up- to-date and are familiar to both instructors and learners. Therefore, the factors used in choosing a computer software are the power of the software, the ease of use and its popularity.

5.2 Two types of computing functions are required for these training modules:

- data base management; and
- spreadsheet applications.

A number of software packages have been very successful in integrating data base management with spreadsheet applications, and some statistical functions. However, these packages have limitations which dictate against using them in the training program. Nearly all of these packages are memory (or RAM) based, thus severely limiting the size of the data base that could be handled by the package. The availability of RAM banks or boards can increase the memory capacity of a 16-bit computer like an IBM PC/XT or its compatible to something like 8 mega-bytes. However, these are not yet very popularly used. Furthermore, most of these integrated softwares are not designed to handle relational data bases, a feature which is required in developing the management information system proposed in this training program. As a result, two separate software packages have been used in this training program, with each performing one of the two functions mentioned above.

5.3 A large number of data base and spreadsheet packages are available. The choice of one set of packages does not imply that the others available in the market are not suitable. The following packages are chosen for reasons given below:

- DBASE III (version 1.1 or 2) has been chosen for data base management. There are other data base packages which are as powerful as DBASE III, like RBASE 5000 and KNOWLEDGE 2. DBASE III is chosen mainly because it is more user-friendly with its assistant facilities. Other equally if not more powerful softwares like REVELATION and INFORMIX could be adopted in the training program. But it appears DBASE III is more popularly used in IBM PCs or the compatibles. In any case, the adoption of DBASE III in this training program does not preclude the participants from adapting the methodology and approach used in the training program to other data base management software, including newcomers like PARADOX (version 1.1); and

- LOTUS 123 (version 2) has been chosen as the spreadsheet software package largely because of its popularity and its extremely user-friendly approach. Other softwares like VP- PLANNER which is claimed to have almost the same capabilities as Lotus 123, to other software like MULTIPLAN (version 2) which has the additional facility of liking different spreadsheets, could well be adopted, following the approach and methods used in the training program.

5.4 Summing up from the above, the structure of this training program could be visualized as follows:

| Module | Contents | Software |
|---|---|---|
| I | Basic concepts and computer applications | |
| | Unit 1: Issues & problems in educational planning,management and research | |
| | Unit 2: Microcomputer applications | |
| | Unit 3: Data requirements identification and assessment | |
| | | WORDSTAR |
| II | Development of the Education Management Information System | |
| | Unit 1: Data base construction | |
| | Unit 2: Information retrieval | |
| | | DBASE III<br>QUICKCODE III |
| III | The Use of the Education Management Information System for Management Control | |
| | Unit 1: Routine administration of schools and projects | |
| | Unit 2: Monitoring performance of education system | |
| | | DBASE III<br>QUICKREPORT |
| IV | The Use of the Education Management Information System for Planning | |
| | Unit 1: Diagnostic analysis of pupil flow | |
| | Unit 2: Forecasting enrollment in school | |
| | Unit 3: Forecasting teacher and other resource requirements | |
| | | LOTUS 123 |

It may be noted above that the use of WORDSTAR (version 3.3 or 2000) will be demonstrated when Module 1 is presented to the participants so that they may after the training program be able to use wordprocessing software for report writing.

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# Module I

## Introduction to Basic Concepts and Computer Applications to Educational Planning and Management

## I. Introduction

### 1. General Module Objectives

1.1 The purpose of this module is to present to the participants the basic concepts and an introductory discussion on:

(a) Some of the issues and problems in educational planning and management, in as far as the availability and uses of information are concerned;

(b) The potentials in the application of microcomputers in educational planning and management;

(c) The considerations in selecting data items for inclusion into an educational management information system, based on an assessment of the requirements of different users.

1.2 Module Performance Objectives. On completion of this module, the participants are expected to be able to:

(a) Explain the basic issues and problems confronting planners and administrators on the use of information for planning and management;

(b) List the potential applications of microcomputers in educational planning and management;

(c) Make an assessment of the data requirements for planning and management, which could be used as the basis for designing an education management information system.

### 2. The Organization of the Module

2.1 The module is organized into three units as follows:

(a) Unit 1 gives an introductory discussion on the problems and issues confronting educational planners and administrators, especially in regard to the availability and use of information.

(b) Unit 2 introduces some of the potential applications of microcomputers in educational planning and management;

(c) Unit 3 is on user-need identification and the assessment process in the design of an education management information system, where the various potential uses and applications of the management information system will be identified. This will lead to a discussion on the resulting data requirements for the information system.

2.2 It is hoped that this module could serve to present to participants an overview of what will be discussed in much greater detail in the subsequent modules. The discussion on the assessment of data need will also prepare participants for Module II on the construction of the information system, and Modules III-IV on the applications of the information system in planning and management respectively. This will enable participants to appreciate the close interrelationship between data collection and the use of data collected. Furthermore, it is also hoped to underscore in this module the flexibility and versatility that one could have in constructing a computerized data base and in the manipulation of the data, making use of software packages like DBASE III, QUICKCODE III and LOTUS 123.

## II. Unit 1: Issues and Problems in Educational Planning and Management

### 3. Performance Objectives

3.1 On completion of this unit, the participants should be able to:

(a) Understand the difficulties of educational planners and administrators in understanding and responding to problems and malfunctions in the education system;

(b) Appreciate the importance of having accurate, complete and timely information for educational planning and management.

### 4. Instructional Activities

4.1 The main purpose of this unit is to introduce to participants the basic concepts and key issues and problems confronting educational planners and administrators. It is not difficult to draw up a list of problems and issues. However, it would be hard to make up an exhaustive list. Given the diversity and complexity of the subject matter, it is clearly beyond the scope of this module. Therefore, the objective is to, by going through some of the issues and problems in educational planning and management, highlight the need of planners and administrators to understand

quickly changing circumstances and requirements in the education system, and to devise remedial measures accordingly.

4.2 The Process of Planning and Management

4.2.1 The processes of educational planning and management are very much interrelated. This is a point well understood by nearly all planners and administrators. Planning proposes the targets and programs for policy-making. These targets and programs are drawn up on the basis of feedback from experience in management and from research findings, supplemented by the diagnostic analysis undertaken by the planners themselves. Management places its concern on seeing that programs are implemented as planned, and that targets set could be met within the time horizon planned and the resources allocated. Management also has the function of keeping the education system under control. It is an ongoing process of planning, policy-making, implementation, management, and evaluation, with results of one stage leading to another. What has to be added to this process is research. Discussion on the role research activities are beyond the scope of this training programme and are therefore not included in this module.

4.2.2 In real life, the description presented above represents an ideal which is difficult to achieve. Plans are drawn up and implemented long before proper evaluation takes place. Furthermore, circumstances change long before any education plan is approved and implemented. This is partly due to the long planning, budgetary and legislative procedure, and partly due to the fact that variables affecting education such as employment opportunities, available financial resources and student demand are changing rapidly. Thus, the process of formulating plans based on experience from implementation and the management process is often unrealistic at all.

4.3 The Information Gap. One of the crucial difficulties in planning, management and research is what may be called the "information" gap. The "gap" may include:

(a) The ignorance of educational planners and researchers about the so-called "black box" process in education. Planners and educators are far from being able to understand what is happening in the classrooms which makes children of different backgrounds, aptitude, and abilities to become educated as a citizen, employable as a worker and satisfied as a consumer of the education services;

(b) The uncertainty about the future as regards the behavior of the pupils, parents and employers;

(c) The delay in getting, if any, and the lack of perfect knowledge about what is happening within the educational system, and outside the school system. For example, there is a gap between what is planned in the central education ministry and what is being implemented at the regional or school level. The delay in obtaining information which may not be accurate at all about the relationship between the education sector and the labour market would place educational planners and administrators in a bad position to devise remedial measures.

4.4 The Challenge of Planners and Administrators

4.4.1 The challenge posed to planners and administrators is the need to respond quickly to changing circumstances. This means that planners and administrators have to be able to:

(a) Understand the problems based on accurate and timely information;

(b) Assess quickly the implications of any changes in the education plans, the alternative solutions which are open and the implications of the alternative solutions.

4.4.2 The need for timely, complete and accurate information is especially for education systems where multiple actors are involved in taking policy, program, budgetary, and practical (implementation) decisions. In many countries, planners, and policymakers are only responsible for setting the targets, formulating the overall educational programmes and allocating the budget. The actual implementation of the programmes could be in the hands of administrators at the regional levels, school heads or administrators of educational institutions. It is therefore essential to see that programmes are implemented and planners and the actual experience of implementation could be fed back to the central planners and policymakers.

5. Learning Activities

5.1 This unit mainly serves as an introductory discussion leading to Units 2 and 3, as well as the other Modules in this training programme. Therefore, the participants are expected to join in the discussion, giving real life experience they have encountered on the various issues and problems discussed in this Unit. In particular, the participants are requested to:

(a) List incidents where educational plans have to be formulated or even implemented before research results are available. Then the participants will examine what would be the

consequences if the research results turn out not to be what is anticipated or assumed in the educational plans.

(b) List areas of "information gaps" and suggest means of breaking the "gaps."

(c) Develop an "ideal" process of policy formulation and compare this "ideal" to a description of how educational policies are currently formulated in your country.

## III. Unit 2: Microcomputer Applications

### 6. Performance Objectives

6.1 The purpose of this unit is to explore the use of microcomputers in helping educational planners and administrators in solving some of the problems highlighted in Unit 1 above. On completion of this unit, the participants should be able to:

(a) Appreciate the potential of microcomputers in facilitating information exchange and processing, thus overcoming some of the problems encountered in educational planning and management;

(b) List some of the potential uses of microcomputers in educational planning and management.

### 7. Instructional Activities

7.1 The Sharing of Information. In a typical organization, information flow from the operation to the management level is characterized by the summarizing and abstracting process whereby information is selectively filtered as it is passed through the organizational hierarchy. In an education system, the school administrators have detailed information about the pupils, teachers and facilities in the schools. Summary information will be passed to the educational administrators at the district level. These district administrators normally do not have access to information about individual pupils, like their academic performance, their educational life history, their socioeconomic background and their district of residence. Similarly, only sketchy information is available on individual teachers in schools. Usually, they do not know the quality of teaching of teachers, what subject they teach, their teaching load, their teaching experience and the grades they are teaching. In no way are the district administrators able to associate characteristics of individual teachers with the characteristics of the pupils taught by individual teachers concerned. In short, they do not know what is happening within a

school. For a more remote planner or administrator in the central ministry of education, much less information is available on individual schools, not to mention individual teachers. Without access to such information, it is not conceivable that the central planners and administrators can formulate policies that are ultimately meant to affect the quality of teaching and learning within individual schools. Similarly, the district administrators could hardly monitor and control the performance of pupils, teachers and schools in order to enhance school/classroom effectiveness and efficiency.

7.2 The use of microcomputers facilitate tremendously the sharing of the same information around school administrators, district and central planners, and administrators. Little effort would be involved in transferring data files from schools to the district education offices and to the central ministry of education, as well as providing comparative feedback on performance to districts and schools.

7.3 Deconcentration of Planning/Administrative Functions. District administrators know the problems in their district better than their counterparts in the central ministry of education. Yet it is their counterparts who formulate and decide the educational programmes for their districts. The concentration of planning activities is partly due to the need to have efficiency in planning, and partly due to the fact that the district administrators do not have the skill and the necessary support like computing facilities to enable them to take over the planning tasks. With the use of microcomputers, even some of the more complicated forecasting and planning models could be performed on the microcomputers installed in the district education offices. Furthermore, by using the same software developed by the central ministry of education, uniformity and standards could be maintained across different districts.

7.4 Reduction in Planning Lead time. With the use of microcomputers, the lead time required to assess the implications of any changes in the education policies, or of different planning alternatives is drastically reduced. This enables planners and administrators to respond quickly to new problems and to try out a larger number of alternatives before a decision is taken.

8. Learning Activities

8.1 This is an introductory unit, the purpose of which is to simply explore the potential uses of microcomputers in educational planning, management, and research, without technically discussing actual microcomputer applications which would be dealt with in Modules II-IV. The participants, nevertheless, will be invited to:

(a) Comment on the potential benefits that could be derived from the use of microcomputers in educational planning and management;

(b) List potential applications of microcomputers, first from the point of view of national level planners and decisionmakers, then from the perspective of provincial, district, and school level planners, administrators, and practitioners.

## IV. Unit 3: Data Requirement Identification and Assessment

### 9. Learning Objectives

9.1 The main purpose of this section is to sensitize participants as to the close interrelationship between the use of statistics for report, management control, and planning, and the data collection activities. After going through this unit, the participants should:

(a) have a basic grasp of the principal considerations governing the choice of data items in a data collection activity;

(b) be able to adapt their data collection procedure to the changing requirements of planners and administrators.

9.2 Discussion in the section will also lead logically to Module II on the construction of the educational management information system geared to the needs of planners and administrators.

### 10. Instructional Activities

10.1 The Approach to be Adopted in Data Base Construction. The development of an Education Management Information System could follow a "top-down" or "bottom-up" approach, each has its merits and demerits. In this module, both approaches will be adopted:

(a) First of all, the "top-down" approach will be used in finding out the sort of tasks required to be undertaken by planners and administrators in the central government. This will lead to an assessment of the statistical information required to help them perform these tasks;

(b) The data requirements will be examined again from a "bottom-up" perspective, by looking at the specific tasks required to be performed by the provincial officials who are often those actually responsible for collecting the data needed by

planners and administrators in the central government. It is highly desirable to have a management information system created at the provincial level which produces immediate benefits to the provincial planners and administrators in streamlining their planning, management and data collection activities.

10.2 The Tasks of Central Planners and Administrators

10.2.1 The tasks of the central planners/administrators, as far as the use of statistics are concerned, could be grouped into three categories:

(a) Stocktaking:

(1) What are the inputs into the education sector, in terms of:
- the number of schools and places provided;
- the number of teachers available;
- school facilities, such as textbooks available;
- their geographic distribution;

(2) What are the outputs (or the performance) of the education sector, expressed in terms of:
- the number of children being educated;
- their distribution by grade;
- their distribution by geographic district;
- the number of children passing school leaving examinations;

(b) Diagnosis:

(1) The access to and efficiency of education provision, which could be gauged by such indicators as:
- the school enrollment ratio;
- the progression rate of pupils in the system;
- dropout rates;
- repetition rates;

(2) The utilization of resources in the education sector such as:
- the rate of utilization of school buildings;
- the occupancy rate of classrooms;
- the financial resources required, actually available, and spent by schools;

(3) The quality of education, reflected by proxy indicators like:
- the average class size;
- the pupil/teacher ratio;
- the proportion of qualified teachers;

- teacher examination results;
- pupil examination results;
- average costs of pupils and cycle costs;

(4) The question of disparity, which could be approached by repeating the analysis in (1)-(3) above for:
- different regions or districts, as far as regional disparity is concerned;
- different types of schools, reflecting disparity viewed from another perspective;

(c) Forecasting and Planning:

(1) the number of school leavers who will be completing a specified level of education;

(2) the likely size of the student population based on a given set of assumptions as regards the future population size for the school-age group, rates of progression in the school system, etc.;

(3) the requirements for teachers, school buildings and other inputs into the school system, and the estimated recurrent and nonrecurrent costs required, in meeting the projected demand for education under different sets of policy objectives or assumptions;

(4) the required geographical distribution of educational facilities (including new school buildings to be constructed) in meeting given policy objectives (e.g., those aimed at reducing regional disparities in educational provision).

10.2.2 The diagnostic and planning techniques ((b) & (c) above) which could be employed are described in Module IV (The use of the Education Management information System for Planning) and Module III (The use of the Education Management Information System for Management Control). In the later part of this Module, the types of reports that could be produced from the data base for stocktaking purposes ((a) above) will be discussed.

10.3 The Requirements of Provincial Planners/Administrators

10.3.1 The tasks of the provincial officials will mainly be concerned with the management of schools, including the monitoring of standards, performance, etc., of individual schools, and the distribution of physical and other resources allocated by the central government between schools and subdistricts. Their tasks embrace the following:

(a) Reporting

(1) The compilation of the routine statistical returns which form the basis of data input to the statistical system in the Ministry;

(2) The compilation of reports on the number of pupils, number of schools, and number of teachers by type of schools and by subdistrict;

(b) Management Control

(1) Analysis of resource utilization and allocation at the subdistrict level, similar to paragraph 5.1(b)(2) above;

(2) The analysis of resource allocation and spending at the school level. This includes, say, the estimation of the amount of recurrent subsidy to which the schools are entitled, based on prevailing unit costs or standards and information stored in the data base on the enrollment size, number of classes, etc., and comparing the amount with that actually available to the schools concerned;

(3) The production of special reports on those schools whose standards of operation, extent of resource utilization and availability fall below given district or national norms. Examples are:

- names and locality of schools with their pupil/teacher ratio exceeding a given norm;
- names and locality of schools with utilization rates higher than 50%;
- names and locality of schools with the average expenditure per pupil smaller than a given norm;
- examination results;
- average costs per pupil and cycle costs;

(4) Analysis of performance of the education system in the province, as reflected by such proxy indicators as repetition rate, promotion rate, the input/output ratio, etc. It is noted that this sort of analysis using the grade cohort survival method has to be treated with caution, unless

additional information is available on the migration of students between provinces;

(c) Planning

(1) Results of the analysis in (a) and (b) above will give useful indicators as to which schools or subdistricts additional resource inputs (e.g., new classrooms, new library books, more teachers) are required, and their priority in terms of need. With additional information on the existing and anticipated future distribution of the school-age population, a model of school location planning could be developed.

(2) Based on the analysis of the performance of the school system, and with additional demographic information on the future size of the school-age population, it is possible to project the likely demand for school places at the provincial level, making use of the flow model adopted in (b)(3) above. The flow model can also be extended to estimate additional expenditures, classrooms and teachers required to cope with the anticipated increase in demand. Such kinds of forecasts are useful in drawing up budget requests to the central government, and in planning for other resource inputs such as teachers, library books and other equipment, etc.

10.4 Information Items Required for the Data Base

10.4.1 This subsection examines those information items which are considered to be required in helping planners and administrators to perform the tasks mentioned in paragraph 6 above. The information items required could broadly be classified into three main categories:

(a) Pupil data,
(b) Teacher data, and
(c) School data.

The above information items could further be distinguished between stock and flow data. For the purpose of this module, only the primary level of education is concerned. The approach adopted in this module could easily be adapted for junior as well as senior secondary levels.

10.4.2 Pupil Data

(a) Stock data: The following data items (new data items which are not presently collected in the regular surveys

of schools, proposed to be included are marked with asterisks (*)):

- school code (incorporating codes for type of schools, district of schools)
- morning, afternoon or combined session
- school year
- number of pupils by grade and by age
- number of pupils by religion
- number of operating classes by grade

(b) Flow data: The following data items are proposed:

- school code
- morning or afternoon session
- school year
- number of repeaters by grade and *by sex
- number of grade 1 entrants by age and *by sex
- *number of new entrants (other than grade 1) by sex and by grade (This is particularly useful if interschool student mobility is significant.)
- number of grade 6 pupils entering and passing the relevant school leaving public examinations
- *number of graduates promoted by junior secondary schools by types

10.4.3 Teacher Data. Only the stock data are proposed as statistics on teacher mobility are difficult to collect, without having to design a rather complicated questionnaire for schools to complete. Estimation of teacher wastages could still be done by making use of stock data over time and information on the number of graduates from teacher training colleges. (The best method to collect information on teacher flow is to construct an individualized teacher statistical system. This system could be extended to include useful information on the subjects taught or could be taught by teachers, and other personnel information required for finance and management functions. For the purpose of this module, it is not proposed to explore the possibility of setting up such a teacher data base.) The following information items are proposed for the teacher file:

- school code
- morning or afternoon school
- school year
- number of teachers
  - * by sex
  - by whether public or nonpublic
  - by academic qualifications
  - by type of teachers (for primary: head, class, religion & sport)
- number of nonteaching staff

by public or nonpublic
by type (administrative, clerical, other staff)

10.4.4 School Data. Only stock data are concerned in this module, as flow data are usually available from sources like the development or capital programme. Efforts will be made to develop a flow data file which would be useful in, say, school locational planning at the district level. The following data items are proposed for the stock data:

- name of school
- address of school
- school code
- morning, afternoon or combined session
- number of classrooms by whether owned by not
  by condition (good, fair, bad)
- *whether has library and number of library books
- *total incomes broken down by
  parental contribution
  government subsidy
  subsidy from provincial/local authorities
  other contributions from society
  operating surplus from school activities
- *total recurrent expenditure broken down by
  teacher salaries
  salaries for nonteaching staff
  grants to students (if applicable)
  other charges
- *total nonrecurrent expenditure
- *estimated expenditure required to provide the desired services, by recurrent and nonrecurrent

## 11. Learning Activities

11.1 Agenda for Group Discussion. The purpose of group discussion is to facilitate a more in-depth discussion of the relevance of the planning and management tasks, as well as data items suggested in the course. The ultimate objective is to arrive at different possible designs for the management information system and its potential applications, so that the trainees could develop using the methodology and procedures which will be discussed in Module II.

11.2 It is advisable to divide the trainees into smaller groups in order to enlist the active participation of each and every trainee. They will be asked to:

(a) Comment on the relevance of the tasks of the central and provincial planners and administrators outlined in the course content;

(b) Comment on the sufficiency of the data items listed in the course content, and the practicability of collecting these data in their own district;

(c) Suggest additional tasks for both the central and provincial planners and administrators which are not covered in the course content;

(d) Suggest additional data items required to be collected, if any, in order to help the planners and administrators to satisfactorily perform the additional tasks as suggested in (c) above.

12. Post-Assessment

12.1 The purpose of these exercises is to evaluate to what extent the participants have understood the course content outlined above, and help the trainers in deciding the pace of the discussion, in eliciting subject matters in which the trainees have keener interests, and points which require further elaboration.

12.2 The suggested questions for the learners to answer are as follows:

(a) What data items are required to be collected in order to estimate the number of dropouts by grade in primary schools for:

- the country as a whole?
- a given district?

(b) In planning the number of additional primary schools required to be built, what are the data items which planners have to take into account? What further data items are needed to help planners decide the location of these additional schools?

(c) Suppose you are given the task of preparing a planning proposal for the introduction of an inservice teacher training programme, what data items would you need in:

- your argument for the desirability of and possibly the urgency in implementing a programme of inservice teacher training?

- your estimation of the likely demand for the training?

EPP

# EDUCATIONAL POLICY AND PLANNING PROJECT

A GOVERNMENT OF INDONESIA - USAID PROJECT

# INDONESIA

## Microcomputer Applications for Education Planning and Management: A Modular Training Program

**MODULE II**

**Development of the Educational Management Information System**


Pusat Informatika
Balitbang Dikbud

DEPARTMEN PENDIDIKAN
DAN KEBUDAYAAN

Center for Informatics
Office of Educational and Cultural Research and Development

MINISTRY OF EDUCATION
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## PREFACE

The Educational Policy and Planning (EPP) Project is a seven year project conducted jointly by the Indonesia Ministry of Education (MOEC) and the United States Agency for International Development (USAID). The overall project objective is to improve the quality of education in Indonesia by assisting the MOEC, through the Office of Educational and Cultural Research and Development (Balitbang Dikbud), to formulate better policies and long-term plans. The project aims to improve policy formulation and long-term planning by improving the timeliness, relevance and accuracy of educational data collection, the subsequent analyses of such data, and their ultimate use for policy and decisionmaking.

There are three major components of the EPP Project: (1) development of an integrated management informations system (MIS) within the MOEC, (2) enhancement of MOEC policy research and analysis capacity, and (3) support for MOEC institutional development at the national and provincial level through training and technical assistance. EPP technical advisory staff work closely with counterpart Indonesian staff as part of a collaborative process of developing institutional capacity.

Dr. Boediono
Head, Center for Informatics
Office of Educational and Cultural Research and Development
Department of Education and Culture
Republic of Indonesia

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The EPP Project in collaboration with the USAID Improving the Efficiency of Educational Systems (IEES) Project, publishes EPP documents in order to disseminate this knowledge and extend its usefulness. EPP has carried out a series of policy studies designed to provide answers to key questions facing Indonesian educators. These include:

The Quality of Basic Education
The Quality and Efficiency of Vocational/Technical Education
The Strengthening of Local Education Capacity
Developing Indicators of Educational Efficiency
Teacher Education Issues
Curriculum Reform and Textbook Production
Education, Economic, and Social Development

This series has been planned under the direction of Moegiadi, Balitbang Dikbud, and Boediono, Center for Informatics, Balitbang Dikbud and Simon Ju, EPP Chief of Party.

Editors for the series are Abas Gozali, Reta Hendrati Dewi, Center for Informatics, and Jerry Messec, IEES, Florida State University.

# INTRODUCTION TO EPP TRAINING MODULES ON THE DEVELOPMENT & USE OF MIS ON MICROCOMPUTERS

## 1.0 Purposes

1.1 These training modules on the development and use of the education management information system are primarily designed for planners and administrators at the provincial level, who are responsible for collecting, processing and analyzing statistics for educational planning and management. The main feature of the modules is the use of microcomputers to enhance the speed, flexibility, and versatility in the use of information.

1.2 The purposes of the modules are as follows:

- To introduce to the participants the basic framework of an integrated education management information system which could be used to serve the varied needs of different users;
- To demonstrate how such a system could be set up, making use of microcomputers, and how data could be retrieved for analytical purposes;
- To show how an interactive model(s) for diagnostic, forecasting, planning and budgeting purposes could be developed on microcomputers; and
- To show, as well, how the computer system and the models could easily be modified to cope with unforeseen changes in requirements, with the help of user-friendly software packages abundantly available on the market.

## 2.0 The Hierarchies of Information

2.1 When viewed in terms of the point at which information is collated and used, there are three main levels of information:

- The school level, at which detailed information about individual pupils, teachers and staff (including their name, age, sex, grade, home address, academic performance, qualification, salaries, etc.), as well as information about the schools (e.g., area, number of rooms, equipment, etc.) have to be kept for the smooth running of the schools concerned;
- The district level, where not all the data kept by schools are required. Only summary statistics such as the number of pupils by age, sex and grade, and the amount of recurrent expenditures are required for individual schools; and
- The national level, where, depending on the extent of decentralization, detailed information on individual schools may not be required. Only summary information is collected at the subdistrict or district level.

2.2 Alternatively, depending on the usage, information could be distinguished between that for:

- planning,
- management control, and
- operation.

2.3 Ideally, information at the school, district, and national level should be integrated and shared in one, or one network, of data base(s). For instance, information stored in schools could be computerized, and only the relevant data would be extracted and passed to the computer system kept at the district level;

and the similar procedure could apply to the flow of information between the district and national level. This could help avoid a lot of duplication of work, and solve the problems of quality of data and the time lag in producing the information. With the use of individualized data bases, more accurate information could be made available about pupil and teacher flow, which is extremely useful in planning school location, and teacher demand and supply. The individualized data base could also reduce considerably the data problems confronting educational researchers, especially those engaged in longitudinal studies.

2.4 Similarly, the same can be said of information for planning, management control and operation. For instance, a simple ledger accounting system, if carefully designed and computerized, could provide a wealth of information useful in monitoring spending, analyzing cost structure and efficiency, as well as for forecasting and planning educational expenditures.

2.5 For the purpose of the present training modules, it is not proposed to cover the entire spectrum of the information system as discussed above, which would be clearly beyond the scope of this training program. Attention will mainly be focused on the following:

- The flow of information from schools to the provincial and central offices via the usual channel of school surveys conducted by the Balitbang; and
- The use of such information for planning and administrative purposes at the central as well as provincial level.

Once the participants have mastered the basic principles and techniques discussed in this training program, they should have relatively little difficulties to applying them to different information environments in their daily work.

## 3.0 Organization of the Modules

3.1 There will be four modules in this training program, which are as follows:

- Module I: Overview of basic concepts and computer applications in educational planning, management, and research;
- Module II: The development of the Education Management Information System;
- Module III: The use of the Education Management Information System for management control; and
- Module IV: The use of the Education Management Information System for planning.

## 4.0 The Structure of Instructional/Learning Process

4.1 Much of the emphasis placed in this training program is the use of microcomputers and software packages. Although data base and spreadsheet programs for data files creation and manipulation and modeling have already been designed for the participants, they inevitably have to understand and practice the techniques in the use of microcomputers and software packages. With the availability of many user-friendly software packages and utility programs, computer programming could be kept to a minimum. It is also the aim of this training module to show to the participants that understanding the basic principles and operating system of the various software packages would be sufficient to enable them make full use of the information available to them for planning, management and research. For those participants who have a keen interest in computer programming and in mastering the software package, this training module will prepare them for further improving their computer skills by practicing the techniques demonstrated in this program.

4.2 It is recognized that the design of a management information system should be largely user oriented. It should start by looking at the potential uses of information rather than for the collection of information per se. However, it would be deceptive to assume that all potential uses of information could be foreseen at the time a management information system is constructed. Furthermore, the requirements and practices in educational planning and management in Indonesia vary considerably from province to province. Thus, it is almost impracticable to include the specific requirements of each and every province in designing the training modules.

4.3 Naturally, participants to the training program would come from different divisions of the provincial education offices. Some of them may mainly be concerned with say planning and budgeting, while others in the supervision of schools or other management functions. Some may be involved only in data collection. Consequently, not all parts of the training program would be of equal interest to the participants.

4.4 Taking into account the above considerations, the approach adopted in the design of the training materials is as follows:

- APPLICABILITY is emphasized in the training program. Wherever possible, practical sessions on microcomputer applications are included in the modules so that the participants can have "hands-on" experience in the course. They will also be invited to try to include some of their daily planning, management and research tasks into the practical sessions, making use of some of the techniques and methods discussed in the training program;

- FLEXIBILITY will be introduced in the design of the training materials so that alternate designs and applications of the management information system will be tested during the practical sessions, making full use of the versatility and flexibility of a computerized data base and the computer software packages; and

- a MODULAR approach will be adopted in the course so that each module is as self-contained as possible.

4.5 The structure of the instructional and learning activities for each of the four modules will thus be arranged as follows:

- Overall Objectives of each of the modules will first be stated so that instructors are aware of the while purpose of the module as well as the knowledge which is expected to be imparted during the instructional and learning processes;

- Module Performance Objectives will also be stated to enable the instructors to assess the extent to which the behavior of learners would be changed upon completion of the module. More specific performance objectives will also be given for different instructional units within a module;

- The actual instructional and learning processes are divided into four phases as follows:

  - Instructional activities where the instructors will present to the learners the teaching materials for the module and unit concerned. The teaching materials will cover the basic conceptual issues related to the topic in question, and fundamentals of computer applications that will be demonstrated, highlighting strengths and weaknesses of such applications;

  - User manual where the instructors will carry on with the presentation, but using microcomputers to demonstrate the various applications in planning, management, and research. The detailed step-by-step procedures required to be followed in developing and using the different computer applications will be described in this user manual section. Therefore, this section is designed for both the instructors and the learners;

- Learning activities where the interaction between the instructors and learners will take place. The learners will be asked to:

  - practice the techniques in developing and using the data bases or models demonstrated by the instructors;

  - then the participants will be divided into groups to discuss the concepts, approaches and methods used in the training materials. During the group discussion, they will be asked to suggest alternative approaches to the development and use of the management information system;

  - based on the alternative designs suggested, the learners will, under the guidance of the instructors, actually develop a new management information system and different models of computer applications;

- Post-assessment where the instructors will attempt to evaluate the extent to which the learners have been able to have a firm grasp of the contents of the training materials. A number of questions and assessments have been proposed in the unit, and individual learners will be asked to do the assignments themselves.

## 5.0 Choice of Computer Software Packages

5.1 With the rapid development in computer technology, it is difficult to choose software packages which are both the most up- to-date and are familiar to both instructors and learners. Therefore, the factors used in choosing a computer software are the power of the software, the ease of use and its popularity.

5.2 Two types of computing functions are required for these training modules:

- data base management; and
- spreadsheet applications.

A number of software packages have been very successful in integrating data base management with spreadsheet applications, and some statistical functions. However, these packages have limitations which dictate against using them in the training program. Nearly all of these packages are memory (or RAM) based, thus severely limiting the size of the data base that could be handled by the package. The availability of RAM banks or boards can increase the memory capacity of a 16-bit computer like an IBM PC/XT or its compatible to something like 8 mega-bytes. However, these are not yet very popularly used. Furthermore, most of these integrated softwares are not designed to handle relational data bases, a feature which is required in developing the management information system proposed in this training program. As a result, two separate software packages have been used in this training program, with each performing one of the two functions mentioned above.

5.3 A large number of data base and spreadsheet packages are available. The choice of one set of packages does not imply that the others available in the market are not suitable. The following packages are chosen for reasons given below:

- DBASE III (version 1.1 or 2) has been chosen for data base management. There are other data base packages which are as powerful as DBASE III, like RBASE 5000 and KNOWLEDGE 2. DBASE III is chosen mainly because it is more user-friendly with its assistant facilities. Other equally if not more powerful softwares like REVELATION and INFORMIX could be adopted in the training program. But it appears DBASE III is more popularly used in IBM PCs or the compatibles. In any case, the adoption of DBASE III in this training program does not preclude the participants from adapting the methodology and approach used in the training program to other data base management software, including newcomers like PARADOX (version 1.1); and

- LOTUS 123 (version 2) has been chosen as the spreadsheet software package largely because of its popularity and its extremely user-friendly approach. Other softwares like VP- PLANNER which is claimed to have almost the same capabilities as Lotus 123, to other software like MULTIPLAN (version 2) which has the additional facility of liking different spreadsheets, could well be adopted, following the approach and methods used in the training program.

5.4 Summing up from the above, the structure of this training program could be visualized as follows:

| Module | Contents | Software |
|---|---|---|
| I | Basic concepts and computer applications | |
| | Unit 1: Issues & problems in educational planning,management and research | |
| | Unit 2: Microcomputer applications | |
| | Unit 3: Data requirements identification and assessment | |
| | | WORDSTAR |
| II | Development of the Education Management Information System | |
| | Unit 1: Data base construction | |
| | Unit 2: Information retrieval | |
| | | DBASE III<br>QUICKCODE III |
| III | The Use of the Education Management Information System for Management Control | |
| | Unit 1: Routine administration of schools and projects | |
| | Unit 2: Monitoring performance of education system | |
| | | DBASE III<br>QUICKREPORT |
| IV | The Use of the Education Management Information System for Planning | |
| | Unit 1: Diagnostic analysis of pupil flow | |
| | Unit 2: Forecasting enrollment in school | |
| | Unit 3: Forecasting teacher and other resource requirements | |
| | | LOTUS 123 |

It may be noted above that the use of WORDSTAR (version 3.3 or 2000) will be demonstrated when Module 1 is presented to the participants so that they may after the training program be able to use wordprocessing software for report writing.

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# Module II

## The Construction of the Education Management Information System

## I. Introduction

### 1. Overall Module Objectives

1.1 The purpose of this module is to present to the participants the basic considerations in:

(a) The design and the construction of an integrated and computerized Education Management Information System (making use of microcomputers), which could serve simultaneously the needs of provincial planners/administrators, as well as their counterparts in the central ministry of education. The activities involved include the design of the questionnaires, and the setting up of the data base system for inputting, processing, and storing information;

(b) The use of the Education Management Information System in preparing reports for the central government, and other summary reports required to be compiled from time to time for administrative and planning functions.

1.2 Module Performance Objectives. On completion of this module, the participants are expected to be able to:

(a) Create the computerized information system, making use of microcomputer software packages;

(b) Produce simple reports from the data base so one can construct and retrieve information from it.

### 2. The Organization of the Module

2.1 The module is organized into two units, namely:

(a) Data Base Construction, where the essential considerations and related technical aspects involved in creating a computerized data base will be examined;

(b) Information Retrieval and Reporting, where the use of the data base so constructed for retrieving information and producing simple reports will be demonstrated.

2.2 It is hoped to underline in this module the flexibility and versatility that one could have in constructing a computerized data base, making use of software packages like DBASE III. Therefore, the active involvement of trainees is emphasized. After going through the course contents and the demonstration:

(a) The instructor would invite the trainees to comment on the relevance and practicability of the models and computer systems used in the course content. This would be a free and open discussion;

(b) The trainees are expected to give alternative suggestions to the model and computer system designs, based on their own knowledge and practical experience in school management, educational administration and planning. It would be useful if the trainees could bring along some of their data sheets, questionnaires, and reports used in their work to facilitate discussion and the subsequent practical exercises;

(c) On the basis of the suggested alternative designs, the trainees would be guided to construct different data files and retrieve information from the data files constructed. Although the software package DBASE III chosen for the course requires a fair amount of programming for more sophisticated data base design and information retrieval, the trainees would be shown that their tasks would be greatly simplified by using software packages like QUICKCODE III.

## II. Unit 1: Data Base Development

### 3. Performance Objectives

3.1 The objective of this section is to spell out the step-by-step procedure that could be taken in the construction of a computerized data base. On completion of this unit, the participants are expected to be able to:

(a) Understand the basic considerations in the design of a computerized education management information system;

(b) Draw up the data base structures and the various programmes for data input, storage, and retrieval;

(c) Create the data base files and input data into the data base.

### 4. Instructional Activities

#### 4.1 Sources and Flow of Data

4.1.1 There are two main sources of information, namely:

(a) Administrative records which could provide a lot of statistical information useful for planning and administration;

(b) Questionnaire surveys of schools which represent the more common means of collecting statistics for educational planning and other information required by the central education authorities.

4.1.2 There are definite advantages in trying to make as much use of the administrative records as the source of information, as they are usually more accurate and timely, especially if finances are involved. The problems are that the manner in which these data are classified and analyzed in such a way that they are only useful to those agency/office undertaking the data collection. Thus, they may not be useful to other users, in particular the planners. Furthermore, there may be great difficulty in retrieving such administrative information.

4.1.3 For information derived from questionnaire surveys of schools, it is usually more comprehensive and geared to the requirements of different users. However, there are problems of relevance, especially if the classification, coverage and counting rules are not consistent with the one adopted for finance, budgeting, and other management functions. Moreover, the data may not be available on time, because of the large number of schools involved. As schools may not have any incentive in completing the questionnaires, the data collected may not be reliable due to poor response and inaccurate reporting.

4.1.4 For the purpose of the present discussion, it is assumed that the main, if not only, source of information is from the survey of schools. Efforts will be made, in the design of the management information system, to overcome the problems discussed in paragraph 9.3 above, by trying to:

(a) streamline the procedure of data collection and processing through the use of microcomputers in setting up an integrated data base system;

(b) make the data base more useful to the provincial planners and administrators, by incorporating some of their data needs into the system.

Notwithstanding the above, it is still hoped that in the course of presenting this module to the participants, useful information items which could be obtained from administrative records could be identified and incorporated into the data base.

## 4.2 The Structure of the Data Base

4.2.1 The data base is to be set up at the provincial education office, with each individual record being a school. The data base may be organized into five data files as follows:

(a) the pupil stock file,
(b) the pupil flow file,
(c) the teacher file,
(d) the school file, and
(e) the school master file.

It is of course possible to put all information into a big file for the school as a whole, including information on pupil, teacher and school. This is the case with the present questionnaire format used by the provincial offices which combines the three types of information into one questionnaire. The former approach is adopted in this module, because it is considered more efficient to handle data files with fewer number of fields, especially if the number of records is big. With the use of such software packages as DBASE III, it is always possible to link different data files together for cross tabulations and analyses. Furthermore, the limited number of fields (being 128) permitted in a DBASE III data file almost dictates the adoption of the former approach.

## 4.3 The Creation of the Data Base Files

4.3.1 The essential steps involved in the creation of the three data base files outlined above compromise the following:

(a) The design of data collection forms (i.e., the questionnaires) to be sent to schools);

(b) The design of the structure for different data base files, defining field names, types and lengths. The software package DBASE III will be used in the exercise and the compilation of programs for data entry, validation and editing for the setting up of the data base.

4.3.2 Questionnaire Design. It is highly desirable that the same form could be used for subsequent data preparations (i.e., the input of data collected into the computer system). In designing the form, the need for simplicity and ease of completion on the part of the school staff is stressed. Four different questionnaires are required to be prepared, which are as follows:

(a) questionnaire on the stock of pupils,
(b) questionnaire on pupil flow,
(c) teacher questionnaire, and
(d) school questionnaire.

To facilitate future linkages between different data files, suitable references for identification (e.g., school codes) have to be incorporated into the questionnaires. Suggested specimens for the above four questionnaires are given in Figures I-IV below. It may be noted that efforts have been made to follow the format of the questionnaire now being used by the Ministry to collect statistics from schools. Because of the limited number of fields permitted in a DBASE III data file, that part of the questionnaire covering the age distribution of pupils by grade and by whether public or nonpublic (see Figure I) has been simplified.

4.3.3 In this unit, the questionnaires shown in Figures I-IV will only be used for illustrative purposes. For the practical exercises, and alternative, simplified set of questionnaires will be used, as the statistics available for designing the training materials are not detailed enough for the questionnaire design suggested in Figures I-IV.

Figure I

Questionnaire on the Number of Pupils Enrolled

Name of school _____ School Code [_____]

School Year [_____]

Session: Morning/Afternoon/Combined* Session Code [__]

Number of Pupils Enrolled

| Grade | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| AGE: | | | | | | |
| 6 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 7 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 8 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 9 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 10 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 11 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 12 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 13 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 14 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 15 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 16 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| 17 | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Total | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Public | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Non-public | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| No. of classes | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |

Number of pupils by Religion:

| Islam | Protestant | Katolik | Hindu | Budha | Total |
|---|---|---|---|---|---|
| | | | | | |

Name of Principal_____Signature_____

Date:_____

*Delete as appropriate

## Figure II

## Questionnaire on Pupil Flow

Name of school _____ School Code [_____]

School Year [_____]

Session: Morning/Afternoon/Combined* Session Code [__]

| | GRADE | | | | | | |
|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | Total |
| No. of repeaters | | | | | | | |
| Boys | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Girls | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| TOTAL | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| No. of new entrants | | | | | | | |
| Boys | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Girls | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| TOTAL | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |

Age Distribution of Grade 1 New Entrants:

| Age | < 6 yrs | 7 yrs | 8 yrs | 9 yrs | 10 & over |
|---|---|---|---|---|---|
| Total | | | | | |

Number of Grade 6 pupils taking EBTA in last school year

| No. of Grade 6 pupils | No. taking EBTA | No. passing EBTA |
|---|---|---|
| | | |

Name of Principal:_____ Signature:_____

Date:_____

*Delete as appropriate

Figure III

Teacher Questionnaire

Name of school _____ School Code [_____]

School Year [_____]

Session: Morning/Afternoon/Combined* Session Code [__]

Number of Teachers

| Q | I | II | III | IV | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|
| Public Teacher: | | | | | | | | |
| Head | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Class | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Religion | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Sports | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Nonpublic Teacher: | | | | | | | | |
| Head | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Class | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Religion | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Sports | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
| Total | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |

Q: Qualifications:

I-SD dan Sederajat
II-SGB, SPG, C1, C2, PGA dan UGA
III-SMTP bukan Keguruan
IV-SGA, SPG, SGPLB, SGO, SMOA, KPG
V-SMTA bukan Keguruan
VI-PGSLP
VII-PGSLA, B-1, Sarjana Muda
VIII-B-II, Sarjana

Number of nonteaching staff

| Administrative | | Labourer/Gardener | | Other Staff | |
|---|---|---|---|---|---|
| P | N | P | N | P | N |
| | | | | | |

Name of Principal:_____ Signature:_____

Date:_____

*Delete as appropriate

Figure IV

School Questionnaire

Name of school _____ School Code [_____]

School Year [_____]

Session: Morning/Afternoon/Combined* Session Code [__]

---

I. Facilities Available

| | The condition of classrooms | | | |
|---|---|---|---|---|
| (a) Number of classrooms: | poor | fair | good | Total |
| owned | [ ] | [ ] | [ ] | [ ] |
| not owned | [ ] | [ ] | [ ] | [ ] |
| (b) Number of Science laboratories | | [ ] | | |
| (c) Whether a school library available | | [ ] | | |
| and if yes, number of library books | | [ ] | | |

---

II. School Finances

(a) Recurrent Income for the Year

| Central Govt. recurrent | Provincial/ local govt. | Parents' contrib. | Other contrib. | School profits | Total |
|---|---|---|---|---|---|

(b) Nonrecurrent Income

| Central Govt. | Provincial/local | Others | Totals |
|---|---|---|---|

(c) Recurrent Expenditure

| Teacher sal. | Other salaries | Admin. costs | Others | Total |
|---|---|---|---|---|

(d) Nonrecurrent [ ]

(e) Desired level of expenditure: Recurrent [ ]

Nonrecurrent [ ]

Name of Principal:_____ Signature:_____

Date:_____

*Delete as appropriate

## 4.4 Program Development for Constructing Data Base

4.4.1 In designing the data base, it is always advisable to determine in advance:

(a) The data items to be included in data file;

(b) The field names for each data item, and the key field which would serve as the link to other related data files. It is noted that the maximum number of fields allowed in one data file is 128;

(c) The characteristics of the different fields, i.e., whether the field data type is numeric, character type, data type, logical, or memo type, and the length of the field;

(d) Whether allowance should be made for the inclusion of computed fields.

One need not be too worried about what the initial design is. With a flexible data base software like DBASE III, there is always room for changing the data base structure after the data have been entered. However, caution is required to avoid any drastic changes, as it takes both time and demands careful updating in changing the data base structure, especially when the data base contains a substantial number of records.

4.4.2 To accept and organize the statistics collected from the questionnaires into the microcomputer requires the development of at least the following:

(a) The data base file specifying the structure of the data base, i.e., the names of fields, field lengths, and characteristics;

(b) A program which could facilitate the entering of data into the data base, the so-called ADD program;

(c) A program which could validate data entered, and computations on the data. This program could be linked to the ADD program;

(d) A program to create the index file which could facilitate subsequent data retrieval, data editing and reporting.

4.4.3 Besides the writing of programs to facilitate the input of data into the data files (see 7.4.1(b) above), one can conveniently make use of the various commands and the

assistant in DBASE III for data entry and indexing. This would be demonstrated in the practical session (see Section 8 User Manual).

4.4.4 As discussed above, a school master file would be created as well. This master would contain basic information about the schools in the province, such as name, address and possible other physical facilities such as the number of classrooms. Information contained in this file should not change very often, so that it is not necessary to include such information in the regular surveys of schools. The file could be updated when new classrooms are constructed in the school, or after the school has been closed down, or when new schools are built. For the purposes of the present module, only the following information items are included in the school master file:

(a) school code,
(b) name of school, and
(c) address of school.

Additional information can of course be added into this data base.

## 5. User Manual

### 5.1 Getting Started

5.1.1 The user manual is designed for:

(a) The instructors in demonstrating the various steps involved in constructing a data file and in subsequent information retrieval and reporting;

(b) The trainees in having "hands-on" use of the various microcomputer software which has been designed for the unit, during the practical sessions.

5.1.2 The practical exercises are designed to be run on any IBM compatible microcomputer, operating on DOS 2.0 or above, with at least 256 K bytes of memory, 2 double sided floppy disk drives or 1 double sided disk drive and a hard disk.

5.1.3 The standard software packages used in this unit are DBASE III (Plus or Version 1.1) and QUICKCODE III. In booting up the microcomputer, it is recommended to reserve 20 file and 24 disk buffers (the default values are 8 and 2 respectively) using the CONFIG.SYS file in the DOS diskette.

5.1.4 The various data files and programs designed for this unit are stored in the diskette labeled "EPP Mod.v.1" and "EPP Mod.v.2." The files in the original diskette are protected against modifications and deletion. It is therefore necessary to make a backup copy of the diskettes and use the backups for practical exercises. Any accidental deletion or deliberate amendments to the various data files and programs during the practical sessions would not affect the original data files and programs.

5.1.5 In starting up the system, the following procedure should be adopted:

(a) After the microcomputer has been booted up, change the system prompt (i.e., >) to the B drive or the C drive for the system with a hard disk;

(b) Start up the DBASE III program from the B drive (or the C drive);

(c) Put the Diskette "EPP Mod.v.2 (or 1)" in Drive A.

## 5.2 Creation of the School Master File

5.2.1 Using the simple school master file which contains only three data items (namely school code, school name and address), the essential steps in the initial development of a data base are demonstrated. In planning the data base design, the following have to be considered:

(a) Defining data characteristics, which is to assign to each data item:

(1) the field name, which can be any name not more than 10 characters long. If the data item appears in more than one data base, the same field name should be used. It is essential not to duplicate the field name in the same data file. The following field name is suggested for the school master file:

| | |
|---|---|
| school code: | SCH_CODE |
| school name: | NAME |
| address: | ADDRESS |

The school code (SCH_CODE) is the common field which links the school master file with other data files.

(2) field type, which reflects the attribute of the data for the data item (or field) concerned. The type selected determines the type of manipulation

of the data which is allowed in the system. Five types are allowed in DBASE III:

- character with a max. width of 254 characters
- numeric, with a max. width of 19 and accurate up to 15 digits
- date, with a default width of 8 and reckoned as MM/DD/YY with the slashes automatically provided by DBASE III
- logical, with a default field width of 1 and can only be a T(rue)/F(alse) or Y(es)/N(o) response
- memo which is useful for storing comments about the record. In DBASE III PLUS, up to 5000 characters (more than two full pages of text) can be stored in the memo field. The memo field is stored in a separate file in the disk.

Since no arithmetic operation will be performed on the three fields in the school master file, all the three fields are designated as character fields.

(3) field width is an intelligent guess that has to be made according to the length of the data items. Assigning too short a field width would cause the data items which are longer than the field width to be truncated. The following field widths are suggested:

| | |
|---|---|
| school code: | 12 characters |
| school name: | 30 characters |
| address: | 100 characters |

(b) Indexing which plays a central role in any data base system. The main advantage of indexing is to considerably speed up data retrieval, as building an index is much faster than sorting a file. Up to 7 indexes may be opened at any one time for a data base, and doing so is much more efficient than maintaining 7 sorted files. As the school master file may have to be assessed based on the different type of school, the status of school, the province, district, and subdistrict of the school, it is advisable to have separate fields for these keys:

| | |
|---|---|
| school type: | ST |
| school status: | SS |
| province: | SP |
| district: | SKA |
| subdistrict: | SKE |
| school number: | SE |

The above 6 fields make up the field of school code (SCH_CODE).

(c) computed field--as the 6 fields listed in (b) above are, taken together, the same as the field for school code (i.e., SCH_CODE). In order to avoid the need to input the same information twice during data entry, it is convenient if the value of the field for school code could be generated from the inputs to the 6 other fields. This can be done by concatenating the character strings in the 6 fields listed in (b) above.

5.2.2 The actual process of creating the school master data file is shown in paragraph 8.2.3 below, making use of the CREATE command in DBASE III. The CREATE command accomplishes three tasks:

(a) Creating the data base file;
(b) Defining the structure of the data file; and
(c) Opening the file for data entry, if required.

In the procedures given in paragraph 8.2.3, all DBASE III commands are written in UPPER CASE only and are preceded with an asterisk (*) for ease of reference. As the school master file (names SCHMAS) has already been constructed and stored in the diskette "EPP Mod.v.2," in creating another school master file during the practical sessions, a different file name (say SCHMAS1) should be assigned.

5.2.3 The following steps are suggested in actually creating the school master file:

(a) Start up DBASE III, and at dot command type *SET DEFAULT TO A to specify the drive to store the file;

(b) *CREATE SCHMAS1 and DBASE III will display a screen with highlighted blocks for entry of field names, types of fields, field widths and the numbers of decimal places required;

(c) Enter the information requested as per paragraph 8.2.1 above;

(d) After completing defining the data base, the system will prompt whether one would proceed to data input. One can proceed to data input immediately. Alternatively, one can input data by:

(1) *USE SCHMAS1 to open the data file;
(2) *APPEND to begin adding records;

(e) *DISPLAY STRUCTURE in order to examine the structure of the school master file. The output can be directed to the printer using *DISPLAY STRUCTURE TO PRINT. The following should show up either on screen or from the printer.

Figure V: Structure of SCHMAS

```
Structure for data base:  A:schmas.dbf
Number of data records:   69
Date of last update:      07/21/86
Field   Field Name      Type            Width     Dec
    1   ST              Character           2
    2   SS              Character           1
    3   SP              Character           2
    4   SKA             Character           2
    5   SKE             Character           2
    6   SE              Character           3
    7   SCH_CODE        Character          12
    8   NAME            Character          30
    9   ADDRESS         Character         100
**Total**                                 155
```

(f) There are several ways of viewing the records in the SCHMAS data file:

(1) *USE SCHMAS to open the data file in Diskette "EPP Mod.v.3";

(2) *DISPLAY ALL which causes DBASE III to list the data base on screen, 20 lines (20 records if one record per line) at a time;

(3) *BROWSE which is a full-screen, menu assisted command for editing and appending records;

(g) To create the computed field SCH_CODE, perform the commands:

(1) *REPLACE ALL SCH_CODE WITH ST+SS+SP+SKA+SKE+SE to concatenate the character strings in the 6 fields.

(2) the system would respond after manipulation with "69 records replaced";

(3) *DISPLAY NEXT 10 will list the contents of 10 records after the replace command. The results are shown in the figure following.

Figure VI: Show SCHMAS with DISPLAY

| Record# | ST | SS | SP | SKA | SKE | SE | SCH_CODE | NAME |
|---|---|---|---|---|---|---|---|---|
| 1 | 10 | 1 | 23 | 05 | 02 | 001 | 101230502001 | SDN NOI KEMPO |
| 2 | 10 | 1 | 23 | 05 | 02 | 002 | 101230502002 | PEKAT |
| 3 | 10 | 1 | 23 | 05 | 02 | 003 | 101230502003 | KWANGKO |
| 4 | 10 | 1 | 23 | 05 | 02 | 004 | 101230502004 | SORO |
| 5 | 10 | 1 | 23 | 05 | 02 | 005 | 101230502005 | SORIUTU |
| 6 | 10 | 1 | 23 | 05 | 02 | 006 | 101230502006 | NO2 KEMPO |
| 7 | 10 | 1 | 23 | 05 | 02 | 007 | 101230502007 | BANGGO |
| 8 | 10 | 1 | 23 | 05 | 02 | 008 | 101230502008 | DOROPETI |
| 9 | 10 | 1 | 23 | 05 | 02 | 009 | 101230502009 | NAPA |
| 10 | 10 | 1 | 23 | 05 | 02 | 010 | 101230502010 | NANGAMIRO |

(4) It can be noted from the above table that the values for the field SCH_CODE have all been computed;

(h) To create an index file SCHMAS.NDX by:

(1) *INDEX ON SCH_CODE TO SCHMAS

(2) *DISPLAY NEXT 5 and Figure VII gives the results after the SCHMAS file has been indexed:

Figure VII: Show Indexed SCHMAS by DISPLAY

| Record# | ST | SS | SP | SKA | SKE | SE | SCH_CODE | NAME |
|---|---|---|---|---|---|---|---|---|
| 18 | | | | | | | | |
| 69 | | | | | | | | |
| 1 | 10 | 1 | 23 | 05 | 02 | 001 | 101230502001 | SDN NOI KEMPO |
| 2 | 10 | 1 | 23 | 05 | 02 | 002 | 101230502002 | PEKAT |
| 3 | 10 | 1 | 23 | 05 | 02 | 003 | 101230502003 | KWANGKO |

Records 18 and 69 are displayed first because the two records do not contain any information.

(i) Before closing this subsection, it is useful to introduce two commands which DBASE III provides, for controlling the display and collection of data. They are the @SAY and GET. The entry screen provided by the APPEND command, as demonstrated in the previous exercise, are rather crude and would be difficult to use when a large number of fields are involved. If the field names used are very short abbreviations (e.g., ST, SS, & SKA used in the SCHMAS data file), there would be problems using such crude data entry screen by those clerical officers who are unfamiliar with the data base system. It is not proposed to introduce complex programming into this module, as it is not always deemed

necessary for most purposes. However, it would still be useful to know this tool is available in DBASE III, and an understanding of the two commands would be helpful in looking at the programming generated by QUICKCODE III in the next subsection.

(1) It is necessary first to create a format file called SCHMAS.FMT, using the DBASE III editor:

```
*MODIFY COMMAND SCHMAS.FMT
```

(2) The suggested format file is as follows:

```
@ 3,25 SAY "CUSTOM SCREEN FOR SCHMAS FILE"
@ 4,25 SAY "----------------------------"
@ 6,2 SAY "SCHOOL STATUS & SESSION CODES" GET ST
  PICTURE "99"
@ 6,40 GET SS PICTURE "9"
@ 8,2 SAY "SCHOOL DISTRICT CODES" GET SP PICTURE
  "99"
@ 8,30 GET SKE PICTURE "99"
@ 8,40 GET SKA PICTURE "99"
@ 10,2 SAY "SCHOOL NAME:" GET NAME
@ 12,2 SAY "ADDRESS:" GET ADDRESS
```

(3) 
```
*SET FORMAT TO SCHMAS
*EDIT
```
These would cause the SCHMAS data file to be displayed according to the format defined in the format file. The display on the screen will look like the following:

Figure VIII: Custom Screen for SCHMAS

```
     CUSTOM SCREEN FOR SCHMAS FILE
     ----------------------------

SCHOOL STATUS & SESSION CODES 10         1

SCHOOL DISTRICT CODES 23      02         05

SCHOOL NAME:  SDN NOI KEMPO

ADDRESS:

EDIT  |  <A:>|SCHMAS  |Rec:  1/69    |         |
```

(4) It is also noted that a format file does not need to include all fields in SCHMAS file. The field SCH_CODE has been omitted, as no information needs to be input into this field from the keyboard.

## 5.3 Creation of Pupil and Teacher Data Files

5.3.1 It may be seen from the demonstration in paragraph 5.2 above on the creation of the school master file that there are limitations in the DBASE III APPEND command, as well as in the use of the format file employing the SAY and GET commands. For example:

(a) It is not possible to cater for computer fields at the data entry stage;

(b) No allowance can be made for the use of default values for fields whose values remain the same for a large number of records. An example is the school year for a pupil file;

(c) When a large number of fields are involved, writing a format file becomes a rather cumbersome assignment.

5.3.2 In this subsection, an utility program called QUICKCODE III is introduced. It is a program generator, thus taking off most of the boring work from the data base designers in writing and debugging programs. The main drawback of the program is that it cannot handle more than one data base at a time, and the processing time is rather slow, when QUICKCODE III generated programs are used to input data into a data base.

5.3.3 QUICKCODE III is quite user-friendly. The main steps involved in building a group of utility programs are as follows (all commands are given in UPPER CASE only and are preceded by an asterisk (*)):

(a) Using the Quickscreen Mode to design the input screen to DBASE III:

(1) Starting QUICKCODE III by putting the program disk in Drive A and type *QC and the following screen will appear:

Figure IX: QUICKCODE III Opening Menu

```
                    Q U I C K C O D E   I I I

To Design Your Screen:   Q          |                    To Exit:   E

                          SCREEN SELECTION
                   NEW Name For Your Screen:        N
                   Get an OLD Screen From Disk:     O
                   Get a TEXT File From Disk:       T

                          CUSTOMIZATION
Customize Your Screen Design Commands:                              C
Customize Your Screen Settings (widths, lengths, etc.):            S
Turn on the QUICKMENU Menu Generator:                               M
Change Your Output Options (see list below):                        X

                      GENERATE dBASE-III PROGRAMS
Generate ALL Programs:        ESC        Generate just one:   G

            ADD          DBF     ED      FAU      GET
                  GO     IO              OUT      PRG
                         RPT     SCR     VAL

CURRENT SCREEN IS:        NONAME       (AUTO PILOT ON)
                      ENTER COMMAND
```

(2) Naming the screen by choosing *N (for new name), and then *C:PUPIL1 to create a file PUPIL1 in drive C;

(3) Then select the Quickscreen Mode by typing *Q;

(4) When the blackboard appears, just type the name of the field (preceded by ";") at any position desired, and any other instructions and titles in the same manner;

(5) In the following 3 figures, the Quickscreen Mode for the three data files, namely PUPIL_RC, FLOW_RC and TEA_RC (which have been created and stored in Diskette "EPP Mod.v.2") are displayed to demonstrate how the blackboard in the Quickscreen Mode can be drawn up:

Figure X: Quickscreen Design for PUPIL RC

```
LIN: 2    COL: 0          (AUTO PILOT)      SCR: pupil_rc  DBF: pupil_rc
----------------------%MQ_MODE-----------------------------------------
                Pupil Stock Questionnaire (Format RC)
```

| | | | | | | |
|---|---|---|---|---|---|---|
| Year ;yr# \|School Code \| serial no. \| ;se | ;st | ;ss | ;sp | ;ska Session | ;ske | ;sess |
| Grade \| | I | II | III | IV | V | VI |
| Enrollment | | | | | | |
| Boys | ;em1# | ;em2# | ;em3# | ;em4# | ;em5# | ;em6# |
| Girls | ;ef1# | ;ef2# | ;ef3# | ;ef4# | ;ef5# | ;ef6# |
| Classes | ;c1# | ;c2# | ;c3# | ;c4# | ;c5# | ;c6# |
| Age group | 6 yrs or lower | 7-12 years | 13 yrs and above | Total | | |
| Enrollment | ;ea6# | ;ea7# | ;ea13# | ;et# | | |
| Religion | Moslem | Protestant/Christian | Khatolik | Hindu | Budha | |
| ;sch_code | ;erm# | ;erp# | ;erk# | ;erh# | ;erb# | |

Figure XI: Quickscreen for FLOW RC

```
LIN: 2    COL: 1          (AUTO PILOT)      SCR: flow_rc  DBF: flow_rc
----------------------%MQ_MODE-----------------------------------------
                Pupil Flow Questionnaire (Format RC)
```

| | | | | | | |
|---|---|---|---|---|---|---|
| Year ;yr# \|School Code \| serial no. \| ;se | ;st | ;ss | ;sp | ;ska Session | ;ske | ;sess |
| Final Examination for last year | No. of Grade VI pupils [ ;gl# ] | No. Registered [ ;gt# ] | No. Passed [ ;gp# ] | | | |
| New students for Grade I | No. Registered [ ;elr# ] | No. planned to accept [ ;elp# ] | No. Accepted [ ;ela# ] | | | |
| By age group | 6 yrs & below [ ;ey6# ] | 7 yrs [;ey7#] | 8 yrs [;ey8#] | 9 yrs [;ey9#] | 10 yrs & over [ ;ey10# ] | |
| Repeaters by Grade | I [ ;rt1# ] | II [ ;rt2# ] | III [ ;rt3# ] | IV [ ;rt4# ] | V [ ;rt5# ] | VI [ ;rt6# ] |
| ;sch_code | | | | ;rtt# | ;eyt# | |

Figure XII: Quickscreen for TEA RC

```
LIN: 2    COL: 1          (AUTO PILOT)      SCR: tea_rc  DBF: tea_rc
----------------------%MQ_MODE-----------------------------------------
                Teacher Stock Questionnaire (Format RC)
```

| | | | | | | |
|---|---|---|---|---|---|---|
| Year ;yr# | School Code \| serial no. \| ;se | ;st | ;ss | ;sp Session | ;ska | ;ske ;sess |

| | | | |
|---|---|---|---|
| Nonteaching staff | Administrative | Watchman | Total |
| Public | ;ap# | ;lp# | ;tp# |
| Nonpublic | ;an# | ;ln# | ;tn# |

Teaching Staff  Male = ;tm#  Female = ;tf#  Total = ;tt#

| No. by Cert. | I ;np1# | II ;np2# | III ;np3# | IV ;np4# | V ;np5# | VI ;np6# | VII ;np7# | VIII ;np8# | TOTAL ;npt# |
|---|---|---|---|---|---|---|---|---|---|

| No. by grade | Head | Class | Religion | Sport/Art | Total |
|---|---|---|---|---|---|
| Public | ;ph# | ;pc# | ;pr# | ;ps# | ;pt# |
| Nonpublic | ;nh# | ;nc# | ;nr# | ;ns# | ;nt# |

| | | | | | | |
|---|---|---|---|---|---|---|
| ;sch_code | ;nqt# | ;nht# | ;nct# | ;nrt# | ;nst# | ;gtt# |

(b) Using the Field Mode to define the characteristics of the fields given in the Quickscreen, the default values desired, the range check, the indexes to be used and the computed fields. The main procedures involved are as follows (for detailed instructions, it is necessary to consult the User Manual):

(1) From Quickscreen Mode, one can go to the Field Mode by pressing *CTRL B;

(2) Using the cursor movement arrows to move around in the Field Mode. One can change the following information given in the Field Mode:

- Column 3 data type; noting that in Quickscreen one may have already defined an integer field type by assigning an "#" after the field name, and a money field type (numerical field with two decimal points) by assigning an "$" after the field name;

- Column 4 field length;

- Column 5 file status for each field. This is where one would define the index field by assigning in descending order from 0 to 9;

- Column 6 is where one enters the default value for the field concerned;

- Columns 7 & 8 are for entering the maximum and minimum values for the field.

(3) As a demonstration, the following tables give the design of the field modes for the PUPIL_RC, FLOW_RC and TEA_RC data bases:

Figure XIII: Field Mode for PUPIL RC

| # | FIELDNAME | T | LEN | F | DEFAULT | MIN. | MAX. | ERROR MESSAGE | VAL | ER |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | *NONE* | *NONE* | *NONE* | *NONE* | * | 3 |
| 1 | yr | I | 4 | F | 1985 | 1970 | 2000 | *NONE* | * | 0 |
| 2 | st | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 3 | ss | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 4 | sp | C | 2 | 0 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 5 | ska | C | 2 | 1 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 6 | ske | C | 2 | 2 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 7 | se | C | 3 | 3 | *NONE* | 0 | 999 | *NONE* | * | 0 |
| 8 | sess | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 9 | em1 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 10 | em2 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 11 | em3 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 12 | em4 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 13 | em5 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 14 | em6 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 15 | ef1 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 16 | ef2 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 17 | ef3 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 18 | ef4 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 19 | ef5 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 20 | ef6 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 21 | c1 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 22 | c2 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 23 | c3 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 24 | c4 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 25 | c5 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 26 | c6 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 27 | ea6 | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 28 | ea7 | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 29 | eal3 | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 30 | et | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 31 | sch_code | C | 12 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 32 | erm | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 33 | erp | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 34 | erk | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 35 | erh | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 36 | erb | I | 4 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |

Figure XIV: Field Mode for FLOW RC

| # | FIELDNAME | T | LEN | F | DEFAULT | MIN. | MAX. | ERROR MESSAGE | VAL | ER |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | *NONE* | *NONE* | *NONE* | *NONE* | * | 3 |
| 1 | yr | I | 4 | F | 1985 | 1970 | 2000 | *NONE* | * | 0 |
| 2 | st | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 3 | ss | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 4 | sp | C | 2 | 0 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 5 | ska | C | 2 | 1 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 6 | ske | C | 2 | 2 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 7 | se | C | 3 | 3 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 8 | sess | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 9 | gl | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 10 | gt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 11 | gp | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 12 | elr | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 13 | elp | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 14 | ela | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 15 | ey6 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 16 | ey7 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 17 | ey8 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 18 | ey9 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 19 | ey10 | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 20 | rt1 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 21 | rt2 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 22 | rt3 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 23 | rt4 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 24 | rt5 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 25 | rt6 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 26 | sch_code | C | 12 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 27 | rtt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 28 | eyt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |

Figure XV: Field Mode for TEA RC

| # | FIELDNAME | T | LEN | F | DEFAULT | MIN. | MAX. | ERROR MESSAGE | VAL | ER |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | *NONE* | *NONE* | *NONE* | *NONE* | * | 3 |
| 1 | yr | I | 4 | F | 1985 | 1970 | 2000 | *NONE* | * | 0 |
| 2 | st | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 3 | ss | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 4 | sp | C | 2 | 0 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 5 | ska | C | 2 | 1 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 6 | ske | C | 2 | 2 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 7 | se | C | 3 | 3 | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 8 | sess | C | 1 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 9 | ap | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 10 | lp | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 11 | tp | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 12 | an | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 13 | ln | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 14 | tn | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 15 | tm | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 16 | tf | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 17 | tt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 18 | np1 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 19 | np2 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 20 | np3 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 21 | np4 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 22 | np5 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 23 | np6 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 24 | np7 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 25 | np8 | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 26 | npt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 27 | ph | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 28 | pc | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 29 | pr | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 30 | ps | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 31 | pt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 32 | nh | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 33 | nc | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 34 | nr | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 35 | ns | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 36 | nt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 37 | sch_code | C | 12 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 38 | nqt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 39 | nht | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 40 | nct | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 41 | nrt | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 42 | nst | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 43 | gtt | I | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |

(4) To create computed fields and determine which fields should be displayed in the data entry screen, one needs to display another part of the Field Mode by pressing the *F6 key. Pressing *F5 key brings one back to the previous display. For the other part of the Field Mode, one can only change the following:

- Column 6 to determine whether the field concerned should appear in the data entry screen or not:
  YES for show
  NO for do not show;

- Column 7 for specifying the computation required for the fields concerned. The computation can use any of the fields defined earlier than the computed field itself.

(5) The following figures illustrate the use of the various computed fields in the three data files, PUPIL_RC, FLOW_RC, and TEA_RC, and those fields which do not appear in the data entry screen:

Figure XVI: Field Mode for Computed Fields for PUPIL RC

| # | FIELDNAME | T | LEN | F | SHOW | COMPUTATION | ER |
|---|---|---|---|---|---|---|---|
| 22 | c2 | I | 2 | F | YES | *NONE* | 0 |
| 23 | c3 | I | 2 | F | YES | *NONE* | 0 |
| 24 | c4 | I | 2 | F | YES | *NONE* | 0 |
| 25 | c5 | I | 2 | F | YES | *NONE* | 0 |
| 26 | c6 | I | 2 | F | YES | *NONE* | 0 |
| 27 | ea6 | I | 4 | F | YES | *NONE* | 0 |
| 28 | ea7 | I | 4 | F | YES | *NONE* | 0 |
| 29 | eal3 | I | 4 | F | YES | *NONE* | 0 |
| 30 | et | I | 4 | F | YES | ea6+ea7+eal3 | 0 |
| 31 | sch_code | C | 12 | F | NO | st+ss+sp+ska+ske+se | 0 |
| 32 | erm | I | 4 | F | YES | *NONE* | 0 |
| 33 | erp | I | 4 | F | YES | *NONE* | 0 |
| 34 | erk | I | 4 | F | YES | *NONE* | 0 |
| 35 | erh | I | 4 | F | YES | *NONE* | 0 |
| 36 | erb | I | 4 | F | YES | *NONE* | 0 |

Figure XVII: Field Mode for Computed Fields for FLOW RC

| # | FIELDNAME | T | LEN | F | SHOW | COMPUTATION | ER |
|---|---|---|---|---|---|---|---|
| 22 | rt3 | I | 2 | F | YES | *NONE* | 0 |
| 23 | rt4 | I | 2 | F | YES | *NONE* | 0 |
| 24 | rt5 | I | 2 | F | YES | *NONE* | 0 |
| 25 | rt6 | I | 2 | F | YES | *NONE* | 0 |
| 26 | sch_code | C | 12 | F | NO | st+ss+sp+ska+ske+se | 0 |
| 27 | rtt | I | 3 | F | YES | rt1+rt2+rt3+rt4+rt5+rt6 | 0 |
| 28 | eyt | I | 3 | F | YES | ey6+ey7+ey8+ey9+ey10 | 0 |

Figure XVIII: Field Mode for Computed Fields for TEA RC

| # | FIELDNAME | T | LEN | F | SHOW | COMPUTATION | ER |
|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | YES | *NONE* | 3 |
| 1 | yr | I | 4 | F | YES | *NONE* | 0 |
| 2 | st | C | 2 | F | YES | *NONE* | 0 |
| 3 | ss | C | 1 | F | YES | *NONE* | 0 |
| 4 | sp | C | 2 | 0 | YES | *NONE* | 0 |
| 5 | ska | C | 2 | 1 | YES | *NONE* | 0 |
| 6 | ske | C | 2 | 2 | YES | *NONE* | 0 |
| 7 | se | C | 3 | 3 | YES | *NONE* | 0 |
| 8 | sess | C | 1 | F | YES | *NONE* | 0 |
| 9 | ap | I | 2 | F | YES | *NONE* | 0 |
| 10 | lp | I | 2 | F | YES | *NONE* | 0 |
| 11 | tp | I | 3 | F | YES | ap+lp | 0 |
| 12 | an | I | 2 | F | YES | *NONE* | 0 |
| 13 | ln | I | 2 | F | YES | *NONE* | 0 |
| 14 | tn | I | 3 | F | YES | an+ln | 0 |
| 15 | tm | I | 3 | F | YES | *NONE* | 0 |
| 16 | tf | I | 3 | F | YES | *NONE* | 0 |
| 17 | tt | I | 3 | F | YES | tm+tf | 0 |
| 18 | np1 | I | 2 | F | YES | *NONE* | 0 |
| 19 | np2 | I | 2 | F | YES | *NONE* | 0 |
| 20 | np3 | I | 2 | F | YES | *NONE* | 0 |
| 21 | np4 | I | 2 | F | YES | *NONE* | 0 |
| 22 | np5 | I | 2 | F | YES | *NONE* | 0 |
| 23 | np6 | I | 2 | F | YES | *NONE* | 0 |
| 24 | np7 | I | 2 | F | YES | *NONE* | 0 |
| 25 | np8 | I | 2 | F | YES | *NONE* | 0 |
| 26 | npt | I | 3 | F | YES | np1+np2+np3+np4+np5+np6+np7+np8 | 0 |
| 27 | ph | I | 2 | F | YES | *NONE* | 0 |
| 28 | pc | I | 2 | F | YES | *NONE* | 0 |
| 29 | pr | I | 2 | F | YES | *NONE* | 0 |
| 30 | ps | I | 2 | F | YES | *NONE* | 0 |
| 31 | pt | I | 3 | F | YES | ph+pc+pr+ps | 0 |
| 32 | nh | I | 2 | F | YES | *NONE* | 0 |
| 33 | nc | I | 2 | F | YES | *NONE* | 0 |
| 34 | nr | I | 2 | F | YES | *NONE* | 0 |
| 35 | ns | I | 2 | F | YES | *NONE* | 0 |
| 36 | nt | I | 3 | F | YES | nh+nc+nr+ns | 0 |
| 37 | sch_code | C | 12 | F | NO | st+ss+sp+ska+ske+se | 0 |
| 38 | nqt | I | 3 | F | NO | np1+np3+np5 | 0 |
| 39 | nht | I | 2 | F | NO | ph+nh | 0 |
| 40 | nct | I | 2 | F | NO | pc+nc | 0 |
| 41 | nrt | I | 2 | F | NO | pr+nr | 0 |
| 42 | nst | I | 2 | F | NO | ps+ns | 0 |
| 43 | gtt | I | 3 | F | YES | pt+nt | 0 |

(6) Some of the computed fields which appear on the data entry screen are useful in facilitating on-line checking of the accuracy of the data. These include, for instance, the GTT field in the TEA_RC data file and the RTT field in the FLOW_RC data file.

(c) Using the Main Menu to generate the programs required. An illustration of the Main Menu is given in Figure IX.

(1) The program generation is activated by *ESC (for generating all programs listed in the Main Menu) or *G (for generating individual programs). One can go to the X menu to change the list of programs displayed on the Main Menu;

(2) The 12 programs usually required are:

- main menu program (.PRG)
- input/output screen program (.IO)
- the output display program (.OUT)
- program for adding records (.ADD)
- program for running reports (.RPT)
- program for finding individual records (.GET)
- program for editing a record (.ED)
- program for setting default values (.FAU)
- program for validation (.VAL)
- program for creating an index file (.GO)
- the screen definition program (.SCR)
- the data base file (.DBF)

(3) After the programs have been generated, it would be quite informative to browse over the programs using either an ordinary Wordstar program or the DBASE III MODIFY COMMAND to look at the programs. Alternatively, they can be printed.

5.3.4 The Pupil Files. Two pupil stock files have been created using QUICKCODE III:

(a) The PUPIL file, based on the questionnaire given in Figure I is stored in Diskette "EPP Mod.v.1." There are 11 programs and the data base file, all of which are assigned the name PUPIL.XXX (XXX being the name used to distinguish the type of files, e.g., .DBF refers to data base file and .ADD refers to the program to add records). No records have been added to the data base.

(b) To have a look at the PUPIL data file, the following procedure may be followed:

(1) Start up DBASE III from Drive C or Drive B, and put the Diskette in Drive A;

(2) *SET DEFAULT TO A

(3) *DO PUPIL will tell DBASE III to run the program called PUPIL.PRG which will display a screen from which different programs can be selected:

- ADD program for adding records. It is useful to examine the data input screen design;
- GET/EDIT program for retrieving and editing individual records;
- INDEX program is to create the Index file PUPIL.NDX according to the index keys created in the GO program. The index keys are defined in the Field Mode;
- RUN report program is to run reports using report format already defined or create reports using the DBASE III report generator.

(4) A specimen screen for the program menu generated by the PUPIL_RC.PRG program is shown in Figure XIX below:

Figure XIX: Screen Design for PUPIL RC.PRG

MAIN MENU

SYSTEM: pupil_rc DBF: pupil_rc

A to ADD data
G to GET/EDIT data
R to RUN report

I to INDEX data base

Q to QUIT (exit to DOS)
D to return to DBASE III

PLEASE ENTER YOUR CHOICE:

(c) The pupil file which will be used for demonstration in this module is the PUPIL_RC file. It is based on the questionnaire "Format RC" used by Balitbang. The data

file is contained in the Diskette "EPP Mod.v.2." The following procedure may be used in examining this data file:

(1) Start up DBASE III from Drive C or Drive B and put the Diskette in Drive A;

(2) *SET DEFAULT TO A;

(3) *USE PUPIL_RC;

(4) *LIST STRUCTURE TO PRINT. This will give the data base structure of PUPIL_RC, as follows:

Figure XX: Data Structure of PUPIL RC

Structure for Data Base A:Pupil_RC
Number of data records: 65
Date of last update: 07/26/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | YR | Numeric | 4 | |
| 2 | ST | Character | 2 | |
| 3 | SS | Character | 1 | |
| 4 | SP | Character | 2 | |
| 5 | SKA | Character | 2 | |
| 6 | SKE | Character | 2 | |
| 7 | SE | Character | 3 | |
| 8 | SESS | Character | 1 | |
| 9 | EM1 | Numeric | 3 | |
| 10 | EM2 | Numeric | 3 | |
| 11 | EM3 | Numeric | 3 | |
| 12 | EM4 | Numeric | 3 | |
| 13 | EM5 | Numeric | 3 | |
| 14 | EM6 | Numeric | 3 | |
| 15 | EF1 | Numeric | 3 | |
| 16 | EF2 | Numeric | 3 | |
| 17 | EF3 | Numeric | 3 | |
| 18 | EF4 | Numeric | 3 | |
| 19 | EF5 | Numeric | 3 | |
| 20 | EF6 | Numeric | 3 | |
| 21 | C1 | Numeric | 2 | |
| 22 | C2 | Numeric | 2 | |
| 23 | C3 | Numeric | 2 | |
| 24 | C4 | Numeric | 2 | |
| 25 | C5 | Numeric | 2 | |
| 26 | C6 | Numeric | 2 | |
| 27 | EA6 | Numeric | 4 | |
| 28 | EA7 | Numeric | 4 | |
| 29 | EA13 | Numeric | 4 | |
| 30 | ET | Numeric | 4 | |
| 31 | SCH_CODE | Character | 12 | |
| 32 | ERM | Numeric | 4 | |
| 33 | ERP | Numeric | 4 | |
| 34 | ERK | Numeric | 4 | |
| 35 | ERH | Numeric | 4 | |
| 36 | ERB | Numeric | 4 | |
| | **Total** | | 114 | |

It is useful to cross reference the data structure shown in the above with the Quickscreen design for the PUPIL_RC given in Figure X and the Field Mode in Figure XIII.

(5) To add records, browse or edit the existing records in the PUPIL_RC data base, one can use the DBASE III command such as APPEND, BROWSE or EDIT. However, it would be more convenient to use the various programs generated by QUICKCODE III, which will present the data in a better manner on the screen:

- *DO PUPIL_RC to run the menu program;

- From the menu, one can select a variety of functions such as add, get, or edit.

5.3.5 Pupil Flow Files. Two data files have also been created for the pupil flow data:

(a) The FLOW data file which is modeled on the questionnaire design given in Figure II. This data file is only used for demonstration purposes as no data have been added into the file.

(b) The FLOW_RC data file which is based on the questionnaire "Format RC" used by the Balitbang. Sample records have been added into this data file.

(c) To view the design of FLOW, the following procedure may be taken:

(1) Start up DBASE III from Drive C or Drive B, and put the Diskette "EPP Mod.v.1" in Drive A;

(2) *SET DEFAULT TO A;

(3) *DO FLOW to start up the Flow program menu from which a variety of functions such as add, get and edit may be performed.

(d) To view the data in the FLOW_RC file, the following procedure may be taken:

(1) Start up DBASE III from Drive C or Drive B and put the Diskette "EPP Mod.v.3" in Drive A;

(2) *SET DEFAULT TO A;

(3) *USE FLOW_RC to open the data file;

(4) *LIST STRUCTURE TO PRINT to examine the data structure of the file. The following should appear on the printer:

Figure XXI: Data Structure for FLOW RC

Structure for data base: A:flow_rc.dbf
Number of data records: 67
Date of last update: 07/27/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | YR | Numeric | 4 | |
| 2 | ST | Character | 2 | |
| 3 | SS | Character | 1 | |
| 4 | SP | Character | 2 | |
| 5 | SKA | Character | 2 | |
| 6 | SKE | Character | 2 | |
| 7 | SE | Character | 3 | |
| 8 | SESS | Character | 1 | |
| 9 | GL | Numeric | 3 | |
| 10 | GT | Numeric | 3 | |
| 11 | GP | Numeric | 3 | |
| 12 | E1R | Numeric | 3 | |
| 13 | E1P | Numeric | 3 | |
| 14 | E1A | Numeric | 3 | |
| 15 | EY6 | Numeric | 3 | |
| 16 | EY7 | Numeric | 3 | |
| 17 | EY8 | Numeric | 3 | |
| 18 | EY9 | Numeric | 3 | |
| 19 | EY10 | Numeric | 3 | |
| 20 | RT1 | Numeric | 2 | |
| 21 | RT2 | Numeric | 2 | |
| 22 | RT3 | Numeric | 2 | |
| 23 | RT4 | Numeric | 2 | |
| 24 | RT5 | Numeric | 2 | |
| 25 | RT6 | Numeric | 2 | |
| 26 | SCH_CODE | Character | 12 | |
| 27 | RTT | Numeric | 3 | |
| 28 | EYT | Numeric | 3 | |
| **Total** | | | 81 | |

It would be useful to cross-reference the above data structure with the Quickscreen design for the data base, as shown in Figure XI and the corresponding Field Mode definitions given in Figure XIV;

(5) The records in the FLOW_RC data base can be viewed or edited using the DBASE III commands such as EDIT, BROWSE, or DISPLAY as already discussed in the previous subsections.

Alternatively, the menu program generated by QUICKCODE III can be used to add, retrieve or print the records:

- *DO FLOW_RC;

- And select from the program menu a variety of functions such as add, get, or edit.

5.3.6 Teacher Files. Two data files have also been created for the Teacher File:

(a) One is the TEACHER file which is based on the questionnaire design given in Figure III and is stored in the Diskette "EPP Mod.v.1." This file will be used for reference, and not for actual demonstration as no records have been entered into the data base;

(b) The other is the TEA_RC file which is based on the questionnaire Format RC and a number of records have been added into the data base. The data file, together with other utility programs are stored in the Diskette "EPP Mod.v.2";

(c) To view the design of the data base TEACHER and the other programs generated, the following procedures may be followed:

(1) Start up DBASE III from either Drive C or Drive B and put the Diskette "EPP Mod.v.1" in Drive A;

(2) *SET DEFAULT TO A, and *DO TEACHER; and select from the program menu a variety of functions such as add, get, and edit;

(d) To view the contents of the data base TEA_RC and run some of the programs generated, the following procedures may be followed:

(1) Start up DBASE III from either Drive C or Drive B and put the diskette "EPP Mod.v.2" into Drive A;

(2) *SET DEFAULT TO A, and *USE TEA_RC to open the data base;

(3) *LIST STRUCTURE TO PRINT to print the data base structure of TEA_RC, and the following should be printed:

Figure XXII: Data Structure for TEA RC

Structure for data base: A:tea_rc.dbf
Number of data records: 67
Date of last update: 07/28/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | YR | Numeric | 4 | |
| 2 | ST | Character | 2 | |
| 3 | SS | Character | 1 | |
| 4 | SP | Character | 2 | |
| 5 | SKA | Character | 2 | |
| 6 | SKE | Character | 2 | |
| 7 | SE | Character | 3 | |
| 8 | SESS | Character | 1 | |
| 9 | AP | Numeric | 2 | |
| 10 | LP | Numeric | 2 | |
| 11 | TP | Numeric | 3 | |
| 12 | AN | Numeric | 2 | |
| 13 | LN | Numeric | 2 | |
| 14 | TN | Numeric | 3 | |
| 15 | TM | Numeric | 3 | |
| 16 | TF | Numeric | 3 | |
| 17 | TT | Numeric | 3 | |
| 18 | NP1 | Numeric | 2 | |
| 19 | NP2 | Numeric | 2 | |
| 20 | NP3 | Numeric | 2 | |
| 21 | NP4 | Numeric | 2 | |
| 22 | NP5 | Numeric | 2 | |
| 23 | NP6 | Numeric | 2 | |
| 24 | NP7 | Numeric | 2 | |
| 25 | NP8 | Numeric | 2 | |
| 26 | NPT | Numeric | 3 | |
| 27 | PH | Numeric | 2 | |
| 28 | PC | Numeric | 2 | |
| 29 | PR | Numeric | 2 | |
| 30 | PS | Numeric | 2 | |
| 31 | PT | Numeric | 3 | |
| 32 | NH | Numeric | 2 | |
| 33 | NC | Numeric | 2 | |
| 34 | NR | Numeric | 2 | |
| 35 | NS | Numeric | 2 | |
| 36 | NT | Numeric | 3 | |
| 37 | SCH_CODE | Character | 12 | |
| 38 | NQT | Numeric | 3 | |
| 39 | NHT | Numeric | 2 | |
| 40 | NCT | Numeric | 2 | |
| 41 | NRT | Numeric | 2 | |
| 42 | NST | Numeric | 2 | |
| 43 | GTT | Numeric | 3 | |
| **Total** | | | 108 | |

It would be useful to cross-reference the above data structure with the Quickscreen design for the data base, as shown in Figure XII, and the definitions used in the Field Mode as shown in Figure XV;

(4) *DO TEA_RC to bring up the program menu, from which a variety of functions such as add, get, and edit may be selected to run.

5.3.7 School File. Only one school file which is based on the questionnaire design given in Figure IV, has been created using QUICKCODE III, namely SCHOOL. The data base file and 11 utility programs generated are stored in the Diskette "EPP Mod.v.1." No record has been added into this data file. The following procedure may be followed to examine the design of this data file:

(a) Start up DBASE III from either Drive C or Drive B, and put the Diskette "EPP Mod.v.1" into Drive A;

(b) *SET DEFAULT TO A, and *DO SCHOOL to bring up the program menu from which various other programs may be selected to run.

## 6. Learning Activities

### 6.1 Microcomputer Tutorial Sessions

6.1.1 The purpose of the tutorial sessions is to familiarize the participants on the various techniques on data base construction and usage which are discussed in the User Manual section. In the User Manual Section, the various steps involved in constructing the four data files (namely the school master "SCHMAS," pupil stock "PUPIL_RC," pupil flow "FLOW_RC," and teacher stock "TEA_RC") have been illustrated in detail. This is because it is considered of fundamental importance to have the data base set up properly before any use can be made of the information stored in the data base. The participants are required to go through by themselves the various steps explained in the User Manual Section to:

(a) Construct 4 data files on pupil, pupil flow, teacher and school master, following exactly the same design as proposed in the User Manual Section;

(b) Perform simple manipulations of the four data files by:

(1) Following the procedures suggested in the User Manual section;

(2) And exploring as well the use of other DBASE III functions and commands, which can be found in the application user manual. During this part of the exercise, the instructors will go through some of the commands that could be of use to the participants, which include, for instance:

- GO TOP,
- DELETE, RECALL and PACK,
- COPY STRUCTURE,
- MODIFY STRUCTURE,
- CHANGE FIELDS.

6.1.2 It is stressed that the objective of the tutorial sessions is not to train the participants to become proficient programmers or users of the DBASE III language. It is important also to emphasize that the various commands need NOT be memorized, as there is on-line help and as there is always the opportunity to consult the application user manual. Furthermore, in view of the rapid development in the field of computer hardware and software, any software package could easily become outdated very quickly.

6.2 Group Work Session

6.2.1 The OBJECTIVE of the group work session is to sensitize participants in the versatility and flexibility of a computerized data base, and the ease with which a data base can be designed and modified.

6.2.2 The participants will be divided into groups. Based on the results of the group discussion in Unit 2, the participants, working in groups, will be asked to:

(a) Identify data items which have been omitted from the data bases (namely SCHMAS, PUPIL_RC, FLOW_RC and TEA_RC) which should be included;

(b) Comment on the design of the data base, in terms of:

(1) the format of the data input forms;
(2) the relationship between fields for the computed fields;
(3) additional computed fields that are considered necessary;
(4) the choice of the index fields;

(c) Suggest any validation rules that could be built into the data input system, which could be accommodated in the QUICKCODE III system;

(d) And based on the results of the discussion in (a), (b) and (c) above, design and construct a different information system comprising pupil, pupil flow, teacher, and school data bases. The techniques they have learned, as discussed in the User Manual section, may be employed to undertake this task.

6.2.3 The instructors would be available to help different groups of trainees in the group work sessions.

7. Post-assessment

7.1 The purpose of this post-assessment section is to help the instructors evaluate to what extent the learners are able to understand the contents of the training materials and to perform what is expected from them which is stated in the specific performance objectives given for this Unit.

7.2 The participants are asked to undertake the following exercise individually. However, if microcomputers are not available for each of the participants, they may have to work in groups. The assignment is as follows:

(a) It is desired to develop a data base on pupils in a particular province which could provide planners with the following information:

(1) The total enrollment by sex in junior high schools which have 3 grades from grade 1 to grade 3 in the province in question;

(2) The proportion of children in the junior high school age group (i.e., 13-15 years) who are enrolled in the high schools;

(3) The proportion of overaged children in junior high schools;

(4) The estimated number of dropouts by grade from junior high schools.

(b) Other statistical information available is the number of children in the 13-15 age range, by single years of age, for the province in question.

(c) The learners are expected to perform the following tasks:

(1) Determine the data items required to be collected on pupils;

(2) Design the questionnaire for data collection;

(3) Create a pupil data base and design the data input program for the pupil data file which will include at least the following functions:

- a screen format design for data input which should preferably be similar to the data collection questionnaires;
- adding data to the data base;
- editing data and search for specific records in the data base using the school code as index.

## III. Unit 2: Information Retrieval

### 8. Performance Objectives

8.1 This is an introductory section on the topic of information retrieval from the data bases constructed in the previous section. More in-depth discussion will be held in Module III on the Use of the Education Management Information System for Management Control.

8.2 Upon completion of this section, the participants are expected to be able to:

(a) Do simple manipulation of the data stored in the data base, such as sum, average, and the creation of summary data files;

(b) Produce simple reports from the data bases.

### 9. Instructional Activities

#### 9.1 Querying the Data Base

9.1.1 In the last section, a number of techniques have been discussed on retrieving information from the data base, using command level language such as DISPLAY and BROWSE, as well as the use of the GET and EDIT programs provided by QUICKCODE III. The operation is essentially done at one data file level. Using the SET RELATION command, two data files may be accessed at the same time. Furthermore, with the use of programming and software like QUICKREPORT, more than two data files may be accessed at one time. Access to multiple data bases will NOT be discussed in this Module, which will be the subject for Module III.

9.1.2 One can specify the condition for the retrieval of records from a data base, thus enhancing the usefulness of the DISPLAY or BROWSE command. The ability of setting selection criteria in retrieving information is a very powerful feature of many data base software packages like DBASE III.

9.1.3 In addition, it may often be necessary to perform simple calculations with a data base. For example, it may be required to compile summary statistics such as the total number of teachers, the average number of pupils per school for the whole province, or for a selected district, or even for a given type of school within a selected district. These summary statistics are required, for example, for stocktaking purposes as discussed in paragraph 4.2.1(a). It is always possible to compile such summary statistics from a data base, making use of the arithmetic commands provided by DBASE III. The next consideration would then be how to capture the information. There could be several ways of displaying and capturing the results:

(a) Displaying the results on-screen;

(b) Sending the results to a printer;

(c) When a lot of information is generated from the arithmetical operation, it would be wiser to try to store the data so that the results could be retrieved at a later stage, or used in another operation. To achieve this, one can store the results in the memory variables provided by DBASE III;

(d) As the values stored in the memory variables would disappear once the machine is turned off, the results could also be stored to an external file on-disk.

## 9.2 Reporting

9.2.1 One of the commonest functions of data collection is for the purposes of compiling various reports. Very often, because of the inflexibility in the production of reports provided by an information system, piles of reports have to be produced in advance in anticipation of possible demand from users. However, these reports in general are never read or utilized by users. With a better designed computerized information system, reports that are not frequently used need not be produced in advance, in anticipation of an unlikely requirement that might arise in the course of time. These reports, required on an ad hoc basis, could easily be compiled from the data base, making use of a host of tabulation programmes available for both mainframe computers and microcomputers.

9.2.2 Information stored in a computerized data base can also be written onto a diskette or a removable hard disk if the data volume is very large. Such information can easily be transported from the provincial offices to the central ministry. By doing so:

(a) Considerable amounts of clerical efforts required in transcribing the data can be saved;

(b) The data would be free from manual errors of all sorts;

(c) The central ministry can then have access to the data in the same level of details as the provincial offices, thus enabling:

- a better analysis of the statistics be made at the central ministry;

- a more effective control and monitoring by the central ministry over the activities of the provincial and district offices.

9.2.3 This subsection will examine the simple reporting facilities that could be built into the computerized information system. There are two main approaches:

(a) Information retrieval <u>individually</u> from the 5 data bases (pupil stock, pupil flow, teacher, school, and school master). This can be performed by:

(1) On-line inquiry using the Assistant facilities available in DBASE III to retrieve information about schools;

(2) The creation of a report form to generate reports giving information about a group of schools or summary statistics about a given subdistrict, district, or province, or even about a given type of school within the district specified;

(b) Information retrieval by <u>linking</u> several data bases. This enables information to be retrieved, for example, on pupils as well as teachers. One approach that can be adopted is to <u>join</u> two different data bases into one new file. This is a more powerful feature of a relational data base like DBASE III. By doing so, a new file containing only information needed for the analysis can be used to generate reports, bypassing the inconvenience of having to create reports from multiple data files. This feature will be explored in detail in Module III.

## 10. User Manual

### 10.1 Getting Started

10.1.1 The user manual is designed for both the instructor as well as the trainees. The purpose of this user manual is to put into DBASE III languages from the various functions outlined in this unit, so that:

(a) The instructor can use it to demonstrate, during the practical session, the various steps involved in retrieving information and producing reports from the data bases;

(b) The trainees can follow the steps shown in doing their practical exercises.

10.1.2 The software package needed is DBASE III (Version 1.1 or Plus). The various programs and data files required for the practical session are all contained in the Diskette "EPP Mod.v.2." The files in the original diskette are protected against modifications and deletions. It is therefore necessary to create a backup of this diskette and to use the backup in the practical sessions.

10.1.3 This user manual is divided into three parts as follows:

(a) Part I introduces the techniques of querying the data bases, displaying records selectively. This on-line inquiry is useful in meeting, very quickly, the demand for information about certain schools or types of schools;

(b) Part II demonstrates the use of the arithmetic functions of DBASE III in compiling summary statistics;

(c) Part III outlines the use of report generator to prepare simple reports on the data bases.

### 10.2 On-Line Inquiry

10.2.1 The techniques of querying the data bases using the commands of DBASE III, such as BROWSE and DISPLAY, have been demonstrated in the previous Unit. The facility allowed in DBASE III to select certain groups of records will be demonstrated in this subsection. With this facility, any types of records can be selected for display either on the screen, to the printer or to a file, provided there are suitable keys in the data base to identify these groups of records.

10.2.2 The following demonstrate one method of selectively displaying a specified group of records:

(a) Start up DBASE III from either Drive C or Drive B, and put the Diskette "EPP Mod.v.2" in Drive A;

(b) *SET DEFAULT TO A;

(c) *USE PUPIL_RC to open the data base PUPIL_RC;

(d) *DISPLAY OFF SCH_CODE, ET FOR SKA="05" .AND. SKE="01", and the following would appear on the screen:

| sch_code | et |
|---|---|
| 101230501001 | 284 |
| 101230501002 | 201 |
| 101230501003 | 341 |
| 101230501004 | 249 |
| 101230501005 | 147 |
| 101230501006 | 182 |
| 101230501007 | 220 |
| 101230501008 | 327 |
| 101230501010 | 208 |
| 101230501011 | 113 |
| 102230501032 | 196 |
| 102230501033 | 269 |
| 102230501034 | 287 |
| 102230501035 | 148 |
| 102230501037 | 242 |
| 102230501038 | 235 |
| 102230501039 | 275 |
| 102230501040 | 158 |
| 102230501041 | 229 |
| 102230501042 | 267 |

(e) The above procedure may be repeated for the FLOW_RC data file by:
*USE FLOW_RC

(f) *DISPLAY OFF SCH_CODE,GP,E1A,RTT FOR SKE="04" TO PRINT, and the following will be printed:

| sch_code | gp | ela | rtt |
|---|---|---|---|
| 101230504001 | 21 | 43 | 15 |
| 101230504002 | 16 | 12 | 114 |
| 101230504003 | 12 | 28 | 2 |
| 101230504004 | 18 | 17 | 43 |
| 101230504005 | 0 | 35 | 0 |
| 101230504006 | 9 | 0 | 1 |
| 101230504007 | 31 | 27 | 27 |
| 101230504008 | 13 | 14 | 26 |
| 101230504009 | 2 | 23 | 39 |
| 101230504010 | 21 | 20 | 18 |
| 101230504011 | 0 | 0 | 17 |

(g) A further demonstration is shown here using the TEA_RC data base:

*USE TEA_RC

(h) *DISPLAY OFF SCH_CODE,NHT,NCT,NRT,NST,TT FOR SKA="05" .AND. SKE="02", and the following will be displayed on the screen:

| sch_code | nht | nct | nrt | nst | tt |
|---|---|---|---|---|---|
| 101230502001 | 1 | 4 | 1 | 0 | 6 |
| 101230502002 | 1 | 2 | 0 | 0 | 3 |
| 101230502003 | 1 | 4 | 1 | 0 | 5 |
| 101230502004 | 1 | 3 | 1 | 0 | 6 |
| 101230502005 | 1 | 5 | 1 | 0 | 7 |
| 101230502006 | 1 | 6 | 1 | 1 | 9 |
| 101230502007 | 1 | 3 | 1 | 0 | 5 |
| 101230502008 | 1 | 2 | 1 | 0 | 4 |
| 101230502009 | 1 | 1 | 1 | 0 | 3 |
| 101230502010 | 1 | 2 | 1 | 1 | 5 |
| 101230502011 | 1 | 4 | 1 | 0 | 6 |
| 101230502012 | 1 | 5 | 1 | 0 | 7 |
| 101230502013 | 1 | 4 | 1 | 0 | 6 |
| 101230502014 | 1 | 4 | 1 | 0 | 6 |
| 101230502015 | 1 | 5 | 2 | 2 | 10 |
| 101230502016 | 1 | 3 | 0 | 1 | 5 |
| 101230502017 | 1 | 9 | 2 | 0 | 12 |

## 10.3 Summary Statistics

10.3.1 The basic arithmetic commands used in DBASE III are SUM and AVERAGE:

(a) The SUM command adds up numeric fields in a data base and displays the results on the screen. Fields may be selected for summation from a data base. Furthermore, the results could be stored to a memory variable if the data are required to be retained for subsequent usage;

(b) The AVERAGE command is used to compute the (arithmetic) mean of the fields in a data base. As with the SUM command, fields may be selected based on given criteria, and the results could be stored to a memory variable.

10.3.2 In the demonstration to follow, the results of the SUM and AVERAGE commands are stored in a separate text file using the SET ALTERNATE TO command. Storing the results in an external file on disk will facilitate future retrieval and the printing of the results in reports. The procedures that may be adopted are as follows:

(a) Start up DBASE III in either Drive C or Drive B, and put the Diskette "EPP Mod.v.3" in Drive A;

(b) *SET DEFAULT TO A;

(c) *USE PUPIL_RC to open the data base PUPIL_RC;

(d) *SET ALTERNATE TO PU, and the results will be stored in an external text file called PU.TXT in the Diskette "EPP Mod.v.3";

(e) *SET ALTERNATE ON;

(f) *SUM ALL C1,C2,C3,C4,C5,C6,ET gives the summary statistics on the total number of classes by grade and the total enrollment. The following will be written to PU.TXT as well as displayed on the screen:

```
   65 records summed
c1   c2   c3   c4   c5   c6      et
76   70   66   65   62   72   11785
```

(g) *SUM ALL C1,C2,C3,C4,C5,C6,ET FOR SKE="01", and this will cause the selection of those schools in the subdistrict with the code of "01." This gives the total number of classes by grade and the total enrollment in subdistrict "01." The following will be written to the PU.TXT as well as displayed on the screen:

```
. sum all c1, c2, c3, c4, c5, c6, et for
ske="01"
   20 records summed
c1   c2   c3   c4   c5   c6      et
28   27   24   22   22   19    4578
```

(h) *SUM ALL C1,C2,C3,C4,C5,C6 FOR SKE="04", causes the selection of only those schools in the subdistrict with the code of "04." This gives the total number of classes and the total enrollment in subdistrict "04." The following will be written to the PU.TXT and displayed on the screen:

```
. sum all c1, c2, c3, c4, c5, c6 for ske="04"
   11 records summed
c1   c2   c3   c4   c5   c6
11   10   11   11    9    8
```

(i) *AVERAGE EM1,EF1,ET gives the average male and female enrollment in Primary 1 and the average total enrollment per school. The following will be written to PU.TXT and displayed on the screen:

```
. average eml, efl, et
   65 records averaged
eml   efl   et
 19    19  181
```

(j) *AVERAGE EM1,EF1,ET FOR SKE="01" gives the corresponding averages for schools in subdistrict "01." The following will be written to PU.TXT and displayed on the screen:

```
. average eml, efl, et for ske="01"
   20 records averaged
eml   efl   et
 23    23  229
```

(k) Similarly, *AVERAGE EM1,EF1,ET FOR SKE="04" gives the averages for schools in subdistrict "04":

```
. average eml, efl, et for ske="04"
   11 records averaged
eml   efl   et
 18    13  142
```

(l) Before using the text file, it should be closed by:

```
*SET ALTERNATE OFF
*CLOSE ALTERNATE;
```

(m) Similar procedure may be followed for the FLOW_RC data base by first selecting the file with the command:

*USE FLOW_RC
*SET ALTERNATE TO FL will cause the results to be written to a text file named FL.TXT. This file should contain the following:

```
. sum all gl, gp, elr, ela, rtt
   67 records summed
  gl     gp     elr     ela     rtt
1461   1241    1822    1767    2428

. sum all gl, gp, elr, ela, rtt for ske="01"
   23 records summed
  gl     gp     elr     ela     rtt
 652    584     666     666    1172

. sum gl, gp, elr, ela, rtt for ske="02"
   17 records summed
  gl     gp     elr     ela     rtt
 291    255     494     490     529
```

```
. sum gl, gp, elr, ela, rtt for ske="03"
   16 records summed
  gl     gp     elr     ela     rtt
 325    259     443     392     425

. average gl, gp, elr, ela, rtt
   67 records averaged
  gl     gp     elr     ela     rtt
  22     19      27      26      36

. average gl, gp, elr, ela, rtt for ske="01"
   23 records averaged
  gl     gp     elr     ela     rtt
  28     25      29      29      51

. average gl, gp, elr, ela, rtt for ske="02"
   17 records averaged
  gl     gp     elr     ela     rtt
  17     15      29      29      31

. average gl, gp, elr, ela, rtt for ske="03"
   16 records averaged
  gl     gp     elr     ela     rtt
  20     16      28      24      27
```

(n) For the TEA_RC file, a similar text file has also been created (named TE.TXT) and stored in the Diskette "EPP Mod.v.2." This file should contain the following:

```
. sum all tm, tf, tt, nqt, nht, nct, nrt, nst, for
ske="01"
   23 records summed
  tm     tf     tt     nqt     nht     nct     nrt     nst
 128     84    212       7      23     155      23      11

. sum all tm, tf, tt, nqt, nht, nct, nrt, nst, for
ske="02"
   17 records summed
  tm     tf     tt     nqt     nht     nct     nrt     nst
  85     20    105       0      17      66      17       5

. sum all tm, tf, tt, nqt, nht, nct, nrt, nst, for
ske="03"
   16 records summed
  tm     tf     tt     nqt     nht     nct     nrt     nst
 111     24    135       0      16      96      18       6

. sum all tm, tf, tt, nqt, nht, nct, nrt, nst, for
ske="04"
   11 records summed
  tm     tf     tt     nqt     nht     nct     nrt     nst
  54     10     64       0      10      38      11       5
```

```
. sum all tm, tf, tt, nqt, nht, nct, nrt, nst, for
   67 records summed
 tm    tf    tt    nqt    nht    nct    nrt    nst
378   138   516      7     66    355     69     27

. average tm, tf, tt, nht, nct, nrt, nst
   67 records averaged
 tm    tf    tt    nht    nct    nrt    nst
  6     2     8     1      5      1      0

. average tm, tf, tt, nht, nct, nrt, nst for
ske="01"
   23 records averaged
 tm    tf    tt    nht    nct    nrt    nst
  6     4     9     1      7      1      0

. average tm, tf, tt, nht, nct, nrt, nst for
ske="02"
   17 records averaged
 tm    tf    tt    nht    nct    nrt    nst
  5     1     6     1      4      1      0

. average tm, tf, tt, nht, nct, nrt, nst for
ske="03"
   16 records averaged
 tm    tf    tt    nht    nct    nrt    nst
  7     2     8     1      6      1      0

. average tm, tf, tt, nht, nct, nrt, nst for
ske="04"
   11 records averaged
 tm    tf    tt    nht    nct    nrt    nst
  5     1     6     1      3      1      0
```

10.3.3 Another powerful command of DBASE III in providing summary statistics is the TOTAL command. Like the SUM command, it adds up the values of the numeric fields in a data base. However, the totals can be added based on a grouping key. The results are summarized in a new data base. In other words, a summary data file is created by the TOTAL command, with each subtotal being a record in the new data base. The original data base must be indexed on the key field which determines where the subtotal breaks occur. Using the field option, one can select the fields to be totaled. The following procedures may be followed in creating the summary files:

(a) Start up DBASE III in either Drive C or Drive B, and put the Diskette "EPP Mod.v.3" in Drive A;

(b) *SET DEFAULT TO A;

(c) As the TOTAL will create numeric totals which may cause the data fields in the existing data file to overflow, it would be necessary to increase the field length to avoid overflow. Thus, a duplicate data base has to be created in order to avoid disturbing the original data file. In the following demonstration, the PUPIL_RC data base will be used. A duplicate PUPIL1 has been created using:

```
*USE PUPIL_RC
*COPY TO PUPIL;
```

(d) The duplicate PUPIL1 will be used for the demonstration:

*USE PUPIL1, to open the PUPIL1 and close the PUPIL_RC;

*MODIFY STRUCTURE to increase the field lengths;

*DISPLAY STRUCTURE will give the new structure for PUPIL1 as follows:

```
Structure for data base A:pupill.dbf
Number of data records:      65
Date of last update:      08/10/86
Field  Field Name      Type              Width     Dec
    1  YR             Character             4
    2  ST             Character             2
    3  SS             Character             1
    4  SP             Character             2
    5  SKA            Character             2
    6  SKE            Character             2
    7  SE             Character             3
    8  SESS           Character             1
    9  EM1            Numeric               5
   10  EM2            Numeric               5
   11  EM3            Numeric               5
   12  EM4            Numeric               5
   13  EM5            Numeric               5
   14  EM6            Numeric               5
   15  EF1            Numeric               5
   16  EF2            Numeric               5
   17  EF3            Numeric               5
   18  EF4            Numeric               5
   19  EF5            Numeric               5
   20  EF6            Numeric               5
   21  C1             Numeric               4
   22  C2             Numeric               4
   23  C3             Numeric               4
   24  C4             Numeric               4
   25  C5             Numeric               4
   26  C6             Numeric               4
   27  EA6            Numeric               6
   28  EA7            Numeric               6
   29  EA13           Numeric               6
   30  ET             Numeric               6
   31  SCH_CODE       Character            12
   32  ERM            Numeric               6
   33  ERP            Numeric               6
   34  ERK            Numeric               6
   35  ERH            Numeric               6
   36  ERB            Numeric               6
**Total**                                  168
```

(e) Before using the TOTAL command, the new data file has to be indexed on the key field which determines the breaking subtotals. In this case, the subdistrict field "SKE" will be used as the index:

*INDEX ON SKE TO PU1SKE, which creates a new index file called PU1SKE.NDX;

(f) *TOTAL ON SKE TO PU1RP and the following will show up on the screen:

65 Record(s) totaled
4 Records generated

This means a new data base with only 4 records, each representing the totals for a subdistrict, has been created. The new data base has been named as PU1RP;

(g) *USE PU1RP to open this data base and then to view its content;

(h) *DISPLAY STRUCTURE will give the following:

```
Structure for data base A:pulrp.dbf
Number of data records:      4
Date of last update:      08/10/86
Field  Field Name      Type              Width     Dec
    1  YR             Character             4
    2  ST             Character             2
    3  SS             Character             1
    4  SP             Character             2
    5  SKA            Character             2
    6  SKE            Character             2
    7  SE             Character             3
    8  SESS           Character             1
    9  EM1            Numeric               5
   10  EM2            Numeric               5
   11  EM3            Numeric               5
   12  EM4            Numeric               5
   13  EM5            Numeric               5
   14  EM6            Numeric               5
   15  EF1            Numeric               5
   16  EF2            Numeric               5
   17  EF3            Numeric               5
   18  EF4            Numeric               5
   19  EF5            Numeric               5
   20  EF6            Numeric               5
   21  C1             Numeric               4
   22  C2             Numeric               4
   23  C3             Numeric               4
   24  C4             Numeric               4
   25  C5             Numeric               4
   26  C6             Numeric               4
   27  EA6            Numeric               6
   28  EA7            Numeric               6
   29  EA13           Numeric               6
   30  ET             Numeric               6
   31  SCH_CODE       Character            12
   32  ERM            Numeric               6
   33  ERP            Numeric               6
   34  ERK            Numeric               6
   35  ERH            Numeric               6
   36  ERB            Numeric               6
**Total**                                  168
```

(i) A number of commands may be issued to view the contents of this new data base:

(1) *DISPLAY ALL C1,C2,C3,C4,C5,C6,ET will cause the display of the four records showing the number of classes in each grade from Primary 1 to 6 and the total enrollment for the four subdistricts:

| Record# | c1 | c2 | c3 | c4 | c5 | c6 | et |
|---|---|---|---|---|---|---|---|
| 1 | 28 | 27 | 24 | 22 | 22 | 19 | 4578 |
| 2 | 22 | 18 | 15 | 18 | 17 | 32 | 3126 |
| 3 | 15 | 15 | 16 | 14 | 14 | 13 | 2518 |
| 4 | 11 | 10 | 11 | 11 | 9 | 8 | 1563 |

(2) DISPLAY ALL EM1, EM2, EM3, EM4, EM5, EM6, EF1, EF2, EF3, EF4, EF5, EF6, ET will give the enrollment by sex in each grade from Primary 1 to Primary 6 and the total enrollment for the four subdistricts:

| Record# | em1 | em2 | em3 | em4 | em5 | em6 | ef1 | ef2 | ef3 | ef4 | ef5 | ef6 | et |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 453 | 490 | 437 | 370 | 390 | 276 | 462 | 402 | 333 | 353 | 347 | 258 | 4578 |
| 2 | 337 | 294 | 268 | 283 | 251 | 227 | 349 | 255 | 245 | 244 | 227 | 201 | 3126 |
| 3 | 268 | 214 | 249 | 213 | 157 | 152 | 251 | 247 | 216 | 199 | 191 | 144 | 2518 |
| 4 | 194 | 134 | 128 | 137 | 116 | 116 | 148 | 108 | 125 | 122 | 116 | 120 | 1563 |

(3) *DISPLAY ALL EA6, EA7, EA13, ET will show the total enrollment by age group for each of the four subdistricts:

| Record# | ea6 | ea7 | eal3 | et |
|---|---|---|---|---|
| 1 | 316 | 3878 | 384 | 4578 |
| 2 | 293 | 2608 | 225 | 3126 |
| 3 | 234 | 2212 | 72 | 2518 |
| 4 | 97 | 1328 | 138 | 1563 |

(4) *DISPLAY ALL ERM, ERP, ERK, ERH, ERB, ET will give the total enrollment by religion for each of the four subdistricts:

| Record# | erm | erp | erk | erh | erb | et |
|---|---|---|---|---|---|---|
| 1 | 4555 | 30 | 11 | 40 | 4 | 4578 |
| 2 | 3137 | 9 | 4 | 59 | 3 | 3126 |
| 3 | 2515 | 0 | 1 | 0 | 0 | 2518 |
| 4 | 1563 | 0 | 0 | 0 | 0 | 1563 |

10.3.4 Similar procedures may be followed to produce summary files for the FLOW_RC and TEA_RC using the TOTAL command. It is not proposed to go through these procedures in this User Manual Section. The participants will be asked during the

practical sessions to try to create summary files for the FLOW_RC and TEA_RC data bases (see Trainee Activities subsection below).

## 10.4 Compilation of Simple Reports

10.4.1 In the previous sections, the various commands like DISPLAY have been discussed, which could be used to produce listing of records very quickly. In this subsection, the automatic report generator provided in the DBASE III system will be discussed for creating simple reports from a single data base. In Module III, more complicated report compilation using multiple data bases will be discussed.

10.4.2 The automatic report generator is very easy to use. It can provide totals as well as subtotals for the report generated. Once the report format (whose file name has the extension ".frm") has been defined, it can be used repeatedly. Needless to say, one has to plan the format of the report before activating the report generator. The following procedures may be followed in creating a report using the report generator:

(a) The TEA_RC data base will be used as an illustration. First of all, one has to start up DBASE III in either Drive C or Drive B, and put the Diskette "EPP MOD.v.3" in Drive A;

(b) *SET DEFAULT TO A,
*USE TEA_RC;

(c) If subtotals are required for certain fields like the province (SP), district (SKA) or subdistrict (SKE), one has to index the data base first so that the data base can be accessed in a sequence set down by the index fields:

*INDEX ON SKE TO TESKE which will create an index file TESKE.NDX;

(d) To create a report format type:

*CREATE REPORT TERP1 where TERP1 is the file name assigned to the report format, and a full-screen mode will appear. By following the instructions given, resorting to on-line help where required by pressing *F1, one can create a report on, for example, the number of teachers by sex and the number of nonteaching staff by status, with subtotals given for each subdistrict. The following fields need to be included in the report:

(1) SCH_CODE for school code;
(2) TM for the number of male teachers;
(3) TF for the number of female teachers;
(4) TT for the total number of teachers;
(5) TP for the number of public nonteaching staff;
(6) TN for the number of nonpublic nonteaching staff;

(e) After the report headings and fields have been defined and selected, the screen will look like the following:

```
Options     Groups     Columns     Locate          Exit    08:06:18 pm

                                   SCH_CODE
                                   TM
                                   TF
                                   TT
                                   TP
                                   TN

----------------------------Report Format---------------------------------
School           Total No. of Teachers by Sex          Nonteaching Staff
 Code
                  Male       Female     Total          Public  Nonpublic
--------------------------------------------------------------------------

XXXXXXXXX          ###         ###       ###             ###      ###
--------------------------------------------------------------------------
CREATE REPORT     |<A:>|TERP1.FRM    |Opt:  1/6              |      |
  Position selection bar - .  Select - -+.  Leave Menu - .
Step to any column immediately by selecting the column expression.
```

(f) To run the report, one may select the option of printing only the summary totals for each subgroup defined (i.e., subdistricts in this case) by issuing the following command:

*REPORT FORM TERP1 SUMMARY and the report will be shown on the screen. Alternatively, the report can be printed or written to an external text file on disk:

*REPORT FORM TERP1 TO PRINT SUMMARY, or
*REPORT FORM TERP1 TO FILE TE1 SUMMARY.

The following report should be shown:

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Teacher Statistics by Subdistrict

| School Code | Total No. of Teachers by Sex Male | Female | Total | Nonteaching Staff Public | Nonpublic |
|---|---|---|---|---|---|
| **Subdistrict Code: 01 | | | | | |
| **Subtotal** | 128 | 84 | 212 | 21 | 0 |
| **Subdistrict Code: 02 | | | | | |
| **Subtotal** | 85 | 20 | 105 | 5 | 0 |
| **Subdistrict Code: 03 | | | | | |
| **Subtotal** | 111 | 24 | 135 | 11 | 0 |
| **Subdistrict Code: 04 | | | | | |
| **Subtotal** | 54 | 10 | 64 | 3 | 0 |
| *** Total *** | 378 | 138 | 516 | 40 | 0 |

(g) Selection criterion may be introduced so that only schools for a certain subdistrict will be printed on the report. For example:

*REPORT FORM TERP1 FOR SKA="05" .AND. SKE="01" and the following report should be shown:

Page No. 1
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Teacher Statistics by Subdistrict

| School Code | Total No. of Teachers by Sex | | | Nonteaching Staff | |
|---|---|---|---|---|---|
| | Male | Female | Total | Public | Nonpublic |
| **Subdistrict Code: 01 | | | | | |
| 101230501001 | 7 | 8 | 15 | 1 | 0 |
| 101230501002 | 6 | 4 | 10 | 1 | 0 |
| 101230501003 | 5 | 5 | 10 | 1 | 0 |
| 101230501004 | 8 | 1 | 9 | 1 | 0 |
| 101230501005 | 8 | 3 | 11 | 1 | 0 |
| 101230501006 | 4 | 3 | 7 | 0 | 0 |
| 101230501007 | 6 | 1 | 7 | 1 | 0 |
| 101230501008 | 7 | 4 | 11 | 1 | 0 |
| 101230501009 | 2 | 7 | 9 | 1 | 0 |
| 101230501010 | 6 | 4 | 10 | 1 | 0 |
| 101230501011 | 5 | 1 | 6 | 0 | 0 |
| 102230501032 | 5 | 4 | 9 | 1 | 0 |
| 102230501033 | 5 | 5 | 10 | 1 | 0 |
| 102230501034 | 6 | 4 | 10 | 1 | 0 |
| 102230501035 | 5 | 4 | 9 | 1 | 0 |
| 102230501036 | 5 | 7 | 12 | 1 | 0 |
| 102230501037 | 6 | 3 | 9 | 1 | 0 |
| 102230501038 | 7 | 3 | 10 | 1 | 0 |
| 102230501039 | 5 | 2 | 7 | 1 | 0 |
| 102230501040 | 5 | 1 | 6 | 1 | 0 |
| 102230501041 | 7 | 1 | 8 | 1 | 0 |
| 102230501042 | 4 | 5 | 9 | 1 | 0 |
| 102230501043 | 4 | 4 | 8 | 1 | 0 |
| ** Subtotal ** | 128 | 84 | 212 | 21 | 0 |
| *** Total *** | 128 | 84 | 212 | 21 | 0 |

10.4.3 Following similar procedures, a variety of reports can be produced either by modifying the already defined report formats (using the MODIFY REPORT command) or by creating a fresh report format. It will be left to the participants to try out a number of reports during the practical sessions.

## 11. Learning Activities

### 11.1 Microcomputer Tutorial Session

11.1.1 This tutorial session is divided into two parts. In the first part, the following exercises are proposed:

(a) The participants will be asked to practice the various techniques discussed in this Unit on the querying of the data bases, compiling statistics and the production of simple reports, following exactly the same procedures outlined in the User Manual Section;

(b) In the Diskette "EPP Mod.v.2," apart from the four data bases (SCHMAS.DBF, PUPIL_RC.DBF, FLOW_RC.DBF, and TEA_RC.DBF) and the associated utility programs generated by QUICKCODE III, there are a number of files generated in the User Manual in this Unit:

(1) PU.TXT, FL.TXT and TE.TXT for storing the results of the various arithmetical computations. FL.TXT and TE.TXT have been deliberately erased from the Diskette. The participants are asked to recreate these text files and check their results with those given in the User Manual Section;

(2) the index file for SCHMAS (SCHMAS.NDX) and for TEA_RC (TESKE.NDX) which is indexed to the subdistrict code (SKE). These files have been retained in the Diskette. Thus, in repeating the indexing exercise, the participants have to assign a different index file name (such as SCHMAS1.NDX and TESKE1);

(3) the report format file TERP1.FMT which has been created for the report on the teaching file (TEA_RC). This file has also been retained in the Diskette;

(4) the summary file for PUPIL_RC which has been created using the TOTAL command (i.e., PU1RP) and the duplicate of the PUPIL_RC (i.e., PUPIL1) and the index file PU1SKE created for the TOTAL COMMAND. These files have been retained in the Diskette.

(c) Apart from recreating the text files FL.TXT and TE.TXT and going through the various steps in the User Manual Section, the participants will also be asked to experiment with other commands in the DBASE III system, such as:

(1) "FOR ....OR.", "FOR.....<..";
(2) SET FILTER TO;
(3) COPY STRUCTURE TO and APPEND FROM.

11.1.2 It is stressed that the objective of this tutorial session is to demonstrate the ease in creating simple reports from the data bases, and NOT to train the participants to

become proficient in using the DBASE III report generator. The participants do not need to memorize all the steps involved in the creation of reports.

11.2 Group Work Session

11.2.1 The purpose of the group work session is to explore the alternative use of the data bases for reporting and the compilation of summary statistics. Similar to the group work session in Unit 2, the ultimate objective is to sensitize the participants on the relative ease in information retrieval from a computerized data base.

11.2.2 As in Unit 2, the participants will be divided into groups, preferably in the same manner as in Unit 2. Based on the outcomes of the discussions and group work in Unit 2, the participants will be asked to identify:

(a) the type of reports, and
(b) the kind of summary statistics

which need to be produced by the revised data base design. The required report formats and summary statistics will then be produced by the participants, working in groups, using microcomputers and the DBASE III software package.

11.2.3 The instructors should be available to help the participants during the group work session. In particular, the desired formats of the reports and the types of arithmetical manipulation that need to be performed to produce the required summary statistics have to be discussed among the instructors and trainees. Additional functions provided by the DBASE III system may have to be employed for this practical session.

12. Post-assessment

12.1 The purpose of the post-assessment is to enable the instructors to evaluate the effectiveness of the instructional and learning process in achieving the performance objectives stated above. A number of simple exercises have been suggested below to test the capability of the learners in using the software programs to retrieve information from the data bases.

12.2 The participants will be asked to perform the following tasks on their own:

(a) Produce summary files on the FLOW_RC and TEA_RC data bases using the TOTAL command;

(b) After the summary files have been created, to display some of the records in these new files;

(c) Prepare one report each on the FLOW_RC and PUPIL_RC data bases, following either the format adopted in the User Manual Section, or any other format considered appropriate;

(d) Modify the report format TERP1 by replacing the fields on the number of nonteaching staff (TP and TN) by the fields on the number of head and class teachers (which are the computed fields named NHT and NCT) and print the report;

(e) Using the modified report format in (d) above, to print the subtotals by type of schools rather than by subdistrict. In other words, the data base has to be indexed on the field SS instead of SKE.

EPP

# EDUCATIONAL POLICY AND PLANNING PROJECT

A GOVERNMENT OF INDONESIA - USAID PROJECT

# INDONESIA

## Microcomputer Applications for Education Planning and Management: A Modular Training Program

### MODULE III

**Use of the Management Information System for Management Control**


Pusat Informatika
Balitbang Dikbud
DEPARTMEN PENDIDIKAN DAN KEBUDAYAAN

Center for Informatics
Office of Educational and Cultural Research and Development
MINISTRY OF EDUCATION AND CULTURE

Jakarta, Indonesia

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## PREFACE

The Educational Policy and Planning (EPP) Project is a seven year project conducted jointly by the Indonesia Ministry of Education (MOEC) and the United States Agency for International Development (USAID). The overall project objective is to improve the quality of education in Indonesia by assisting the MOEC, through the Office of Educational and Cultural Research and Development (Balitbang Dikbud), to formulate better policies and long-term plans. The project aims to improve policy formulation and long-term planning by improving the timeliness, relevance and accuracy of educational data collection, the subsequent analyses of such data, and their ultimate use for policy and decisionmaking.

There are three major components of the EPP Project: (1) development of an integrated management informations system (MIS) within the MOEC, (2) enhancement of MOEC policy research and analysis capacity, and (3) support for MOEC institutional development at the national and provincial level through training and technical assistance. EPP technical advisory staff work closely with counterpart Indonesian staff as part of a collaborative process of developing institutional capacity.

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Office of Educational and Cultural Research and Development
Department of Education and Culture
Republic of Indonesia

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The EPP Project in collaboration with the USAID Improving the Efficiency of Educational Systems (IEES) Project, publishes EPP documents in order to disseminate this knowledge and extend its usefulness. EPP has carried out a series of policy studies designed to provide answers to key questions facing Indonesian educators. These include:

The Quality of Basic Education
The Quality and Efficiency of Vocational/Technical Education
The Strengthening of Local Education Capacity
Developing Indicators of Educational Efficiency
Teacher Education Issues
Curriculum Reform and Textbook Production
Education, Economic, and Social Development

This series has been planned under the direction of Moegiadi, Balitbang Dikbud, and Boediono, Center for Informatics, Balitbang Dikbud and Simon Ju, EPP Chief of Party.

Editors for the series are Abas Gozali, Reta Hendrati Dewi, Center for Informatics, and Jerry Messec, IEES, Florida State University.

# INTRODUCTION TO EPP TRAINING MODULES ON THE DEVELOPMENT & USE OF MIS ON MICROCOMPUTERS

## 1.0 Purposes

1.1 These training modules on the development and use of the education management information system are primarily designed for planners and administrators at the provincial level, who are responsible for collecting, processing and analyzing statistics for educational planning and management. The main feature of the modules is the use of microcomputers to enhance the speed, flexibility, and versatility in the use of information.

1.2 The purposes of the modules are as follows:

- To introduce to the participants the basic framework of an integrated education management information system which could be used to serve the varied needs of different users;
- To demonstrate how such a system could be set up, making use of microcomputers, and how data could be retrieved for analytical purposes;
- To show how an interactive model(s) for diagnostic, forecasting, planning and budgeting purposes could be developed on microcomputers; and
- To show, as well, how the computer system and the models could easily be modified to cope with unforeseen changes in requirements, with the help of user-friendly software packages abundantly available on the market.

## 2.0 The Hierarchies of Information

2.1 When viewed in terms of the point at which information is collated and used, there are three main levels of information:

- The school level, at which detailed information about individual pupils, teachers and staff (including their name, age, sex, grade, home address, academic performance, qualification, salaries, etc.), as well as information about the schools (e.g., area, number of rooms, equipment, etc.) have to be kept for the smooth running of the schools concerned;
- The district level, where not all the data kept by schools are required. Only summary statistics such as the number of pupils by age, sex and grade, and the amount of recurrent expenditures are required for individual schools; and
- The national level, where, depending on the extent of decentralization, detailed information on individual schools may not be required. Only summary information is collected at the subdistrict or district level.

2.2 Alternatively, depending on the usage, information could be distinguished between that for:

- planning,
- management control, and
- operation.

2.3 Ideally, information at the school, district, and national level should be integrated and shared in one, or one network, of data base(s). For instance, information stored in schools could be computerized, and only the relevant data would be extracted and passed to the computer system kept at the district level;

and the similar procedure could apply to the flow of information between the district and national level. This could help avoid a lot of duplication of work, and solve the problems of quality of data and the time lag in producing the information. With the use of individualized data bases, more accurate information could be made available about pupil and teacher flow, which is extremely useful in planning school location, and teacher demand and supply. The individualized data base could also reduce considerably the data problems confronting educational researchers, especially those engaged in longitudinal studies.

2.4 Similarly, the same can be said of information for planning, management control and operation. For instance, a simple ledger accounting system, if carefully designed and computerized, could provide a wealth of information useful in monitoring spending, analyzing cost structure and efficiency, as well as for forecasting and planning educational expenditures.

2.5 For the purpose of the present training modules, it is not proposed to cover the entire spectrum of the information system as discussed above, which would be clearly beyond the scope of this training program. Attention will mainly be focused on the following:

- The flow of information from schools to the provincial and central offices via the usual channel of school surveys conducted by the Balitbang; and
- The use of such information for planning and administrative purposes at the central as well as provincial level.

Once the participants have mastered the basic principles and techniques discussed in this training program, they should have relatively little difficulties to applying them to different information environments in their daily work.

## 3.0 Organization of the Modules

3.1 There will be four modules in this training program, which are as follows:

- Module I: Overview of basic concepts and computer applications in educational planning, management, and research;
- Module II: The development of the Education Management Information System;
- Module III: The use of the Education Management Information System for management control; and
- Module IV: The use of the Education Management Information System for planning.

## 4.0 The Structure of Instructional/Learning Process

4.1 Much of the emphasis placed in this training program is the use of microcomputers and software packages. Although data base and spreadsheet programs for data files creation and manipulation and modeling have already been designed for the participants, they inevitably have to understand and practice the techniques in the use of microcomputers and software packages. With the availability of many user-friendly software packages and utility programs, computer programming could be kept to a minimum. It is also the aim of this training module to show to the participants that understanding the basic principles and operating system of the various software packages would be sufficient to enable them make full use of the information available to them for planning, management and research. For those participants who have a keen interest in computer programming and in mastering the software package, this training module will prepare them for further improving their computer skills by practicing the techniques demonstrated in this program.

4.2 It is recognized that the design of a management information system should be largely user oriented. It should start by looking at the potential uses of information rather than for the collection of information per se. However, it would be deceptive to assume that all potential uses of information could be foreseen at the time a management information system is constructed. Furthermore, the requirements and practices in educational planning and management in Indonesia vary considerably from province to province. Thus, it is almost impracticable to include the specific requirements of each and every province in designing the training modules.

4.3 Naturally, participants to the training program would come from different divisions of the provincial education offices. Some of them may mainly be concerned with say planning and budgeting, while others in the supervision of schools or other management functions. Some may be involved only in data collection. Consequently, not all parts of the training program would be of equal interest to the participants.

4.4 Taking into account the above considerations, the approach adopted in the design of the training materials is as follows:

- APPLICABILITY is emphasized in the training program. Wherever possible, practical sessions on microcomputer applications are included in the modules so that the participants can have "hands-on" experience in the course. They will also be invited to try to include some of their daily planning, management and research tasks into the practical sessions, making use of some of the techniques and methods discussed in the training program;

- FLEXIBILITY will be introduced in the design of the training materials so that alternate designs and applications of the management information system will be tested during the practical sessions, making full use of the versatility and flexibility of a computerized data base and the computer software packages; and

- a MODULAR approach will be adopted in the course so that each module is as self-contained as possible.

4.5 The structure of the instructional and learning activities for each of the four modules will thus be arranged as follows:

- Overall Objectives of each of the modules will first be stated so that instructors are aware of the whil[illegible]pose of the module as well as the knowledge which is expected to be imparted during the inst[illegible]ctional and learning processes;

- Module Performance Objectives will also be stated to enable the instructors to assess the extent to which the behavior of learners would be changed upon completion of the module. More specific performance objectives will also be given for different instructional units within a module;

- The actual instructional and learning processes are divided into four phases as follows:

  - Instructional activities where the instructors will present to the learners the teaching materials for the module and unit concerned. The teaching materials will cover the basic conceptual issues related to the topic in question, and fundamentals of computer applications that will be demonstrated, highlighting strengths and weaknesses of such applications;

  - User manual where the instructors will carry on with the presentation, but using microcomputers to demonstrate the various applications in planning, management, and research. The detailed step-by-step procedures required to be followed in developing and using the different computer applications will be described in this user manual section. Therefore, this section is designed for both the instructors and the learners;

- Learning activities where the interaction between the instructors and learners will take place. The learners will be asked to:

  - practice the techniques in developing and using the data bases or models demonstrated by the instructors;

  - then the participants will be divided into groups to discuss the concepts, approaches and methods used in the training materials. During the group discussion, they will be asked to suggest alternative approaches to the development and use of the management information system;

  - based on the alternative designs suggested, the learners will, under the guidance of the instructors, actually develop a new management information system and different models of computer applications;

- Post-assessment where the instructors will attempt to evaluate the extent to which the learners have been able to have a firm grasp of the contents of the training materials. A number of questions and assessments have been proposed in the unit, and individual learners will be asked to do the assignments themselves.

## 5.0 Choice of Computer Software Packages

5.1 With the rapid development in computer technology, it is difficult to choose software packages which are both the most up- to-date and are familiar to both instructors and learners. Therefore, the factors used in choosing a computer software are the power of the software, the ease of use and its popularity.

5.2 Two types of computing functions are required for these training modules:

- data base management; and
- spreadsheet applications.

A number of software packages have been very successful in integrating data base management with spreadsheet applications, and some statistical functions. However, these packages have limitations which dictate against using them in the training program. Nearly all of these packages are memory (or RAM) based, thus severely limiting the size of the data base that could be handled by the package. The availability of RAM banks or boards can increase the memory capacity of a 16-bit computer like an IBM PC/XT or its compatible to something like 8 mega-bytes. However, these are not yet very popularly used. Furthermore, most of these integrated softwares are not designed to handle relational data bases, a feature which is required in developing the management information system proposed in this training program. As a result, two separate software packages have been used in this training program, with each performing one of the two functions mentioned above.

5.3 A large number of data base and spreadsheet packages are available. The choice of one set of packages does not imply that the others available in the market are not suitable. The following packages are chosen for reasons given below:

- DBASE III (version 1.1 or 2) has been chosen for data base management. There are other data base packages which are as powerful as DBASE III, like RBASE 5000 and KNOWLEDGE 2. DBASE III is chosen mainly because it is more user-friendly with its assistant facilities. Other equally if not more powerful softwares like REVELATION and INFORMIX could be adopted in the training program. But it appears DBASE III is more popularly used in IBM PC's or the compatibles. In any case, the adoption of DBASE III in this training program does not preclude the participants from adapting the methodology and approach used in the training program to other data base management software, including newcomers like PARADOX (version 1.1); and

- LOTUS 123 (version 2) has been chosen as the spreadsheet software package largely because of its popularity and its extremely user-friendly approach. Other softwares like VP- PLANNER which is claimed to have almost the same capabilities as Lotus 123, to other software like MULTIPLAN (version 2) which has the additional facility of liking different spreadsheets, could well be adopted, following the approach and methods used in the training program.

5.4 Summing up from the above, the structure of this training program could be visualized as follows:

| Module | Contents | Software |
|---|---|---|
| I | Basic concepts and computer applications | |
| | Unit 1: Issues & problems in educational planning,management and research | |
| | Unit 2: Microcomputer applications | |
| | Unit 3: Data requirements identification and assessment | |
| | | WORDSTAR |
| II | Development of the Education Management Information System | |
| | Unit 1: Data base construction | |
| | Unit 2: Information retrieval | |
| | | DBASE III<br>QUICKCODE III |
| III | The Use of the Education Management Information System for Management Control | |
| | Unit 1: Routine administration of schools and projects | |
| | Unit 2: Monitoring performance of education system | |
| | | DBASE III<br>QUICKREPORT |
| IV | The Use of the Education Management Information System for Planning | |
| | Unit 1: Diagnostic analysis of pupil flow | |
| | Unit 2: Forecasting enrollment in school | |
| | Unit 3: Forecasting teacher and other resource requirements | |
| | | LOTUS 123 |

It may be noted above that the use of WORDSTAR (version 3.3 or 2000) will be demonstrated when Module 1 is presented to the participants so that they may after the training program be able to use wordprocessing software for report writing.

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## Module III


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# Module III

## The Use of the Education Management Information for Management Control

## I. Introduction

### 1. Overall Module Objectives

1.1 This module is NOT a module on the principles of educational management. A number of good references on the practices and principles of educational management are available, which participants in this module could consult. NOR is it one aimed at advising educational planners and administrators what norms and criteria should be set in managing their educational systems and the educational institutions under their control. Nevertheless, this module is still a module on "HOW TO DO" techniques, but the techniques are related to:

(a) The use of information, and
(b) The techniques employed to analyze the information for the purposes of management control.

Based on the results of the analysis, individual administrators have to make up their mind as to what standards should be set and how schools should be managed and their performance regulated.

1.2 Thus, the purposes of this module is to present to the participants:

(a) The use of the education management information system set up in Module II to, at a micro-level, monitor the performance of individual schools and projects;

(b) And at a macro-level, to monitor the performance of the education sector for the country as a whole, or for a particular province, district or subdistrict;

1.3 In this module, the participants will be shown how to take advantage of the computerized information system and other software packages available to manipulate the data and perform a variety of computations for analytical purposes. In other words, the "HOW TO DO" techniques will be demonstrated with the use of microcomputers and software packages, which will help to:

(a) Overcome the problems associated with the need to study statistics on a large number of schools;

(b) Simplify the tasks of the educational administrators in undertaking an excessive amount of calculations on the number of teachers required for individual schools, which could be a cumbersome process because of the large size of the school population and the complicated methods of calculation;

(c) Speed up considerably the response time of both the educational planners and administrators in detecting any malfunctioning of the educational system due to the fact that education indicators and other analysis could be performed quickly.

1.4 Module Performance Objectives. On completion of this module, the participants should be able to:

(a) Make use of the data base software package DBASE III to produce useful information from the education management information system, required for the routine administration of schools in a given district and development projects;

(b) Make use of the data base software package DBASE III to compile educational indicators from the education management information system, for the purposes of managing the education system;

1.5 It is stressed that although the package DBASE III has been chosen for this module, this does not mean that other data base packages are not suitable. Once the fundamentals of the package have been mastered, the participants should have little difficulty in adapting the techniques and methods demonstrated in this module to other data base packages or programs.

2. The Organization of the Module

2.1 This module is organized into two units, as follows:

(a) Unit 1 on the use of the educational management information system for the routine administration of schools and projects. This involves the use of the data collected in the information system at the level of individual schools and development projects;

(b) Unit 2 on the use of the educational management information system for the management of the education system, for a country as a whole or for a given province, district, or subdistrict. This involves the identification and compilation of various indicators on the performance of the education system. As far as the techniques in the use of the data base package is concerned, this Unit is similar to Unit 1, except that data analysis is done at the level of province, district, or subdistrict.

2.2 It is stressed that an interactive approach could be adopted throughout this Module. This is especially important as the requirements for monitoring performance, the relevance of educational indicators constructed, and the diagnostic techniques used in analyzing student flow could change rapidly over time. Furthermore, standards, procedures, and regulations are likely to be different for different provinces and districts. Therefore, it is essential that the participants are able to adapt the systems developed in this Module to suit the specific requirements of their provinces or districts.

## II. Unit 1

## Routine Administration of Schools/Projects

### 3. Performance Objectives

3.1 On completion of this Unit, the participants should be able to:

(a) Identify data items in the Educational Management Information System which could be used to help them in the day-to-day administration of schools;

(b) Have a firm grasp of the techniques of retrieving such data items from the Information System and of analyzing the data items to provide useful management information;

(c) Understand the basic techniques in compiling information required for project management;

(d) Be able to use computer data base packages like DBASE III to perform these tasks.

### 4. Instructional Activities

#### 4.1 Administration of Schools

4.1.1 The tasks of administering schools are so diverse that it is definitely beyond the scope of this Module to deal with. Moreover, the information required by the educational administrators for the effective management of schools is more than what could be provided from the usual statistical surveys of schools. Therefore, what is to be discussed in this Unit is by no means exhaustive. Nevertheless, it is

believed similar techniques could be employed in dealing with other sorts of management tasks not mentioned in this Unit.

4.1.2 At the risk of oversimplification, the tasks of administering schools performed by the central, provincial, or district educational administrators would fall broadly into two main groups:

(a) Supervisory activities which involve the routine day-to-day administration of schools to ensure that they are operated smoothly, according to a set of standards governing the number of teachers to be employed, the qualifications of teachers, the amount of subsidy paid to the schools and pupils, the facilities and equipment that should be available, the maximum or minimum size of the class. The aim is to ensure that schools are given at least the minimum resources in accordance with national or provincial standards in order to function properly.

(b) Advisory activities which involve the provision of professional guidance and advice, on a regular basis, on such matters as teaching methods, the curriculum to be adopted, and other teaching aids that could be employed. The objective is to help schools to provide the best possible education to the children, within the resources available to schools.

4.1.3 Supervisory Activities. The extent of supervisory power that the central, provincial, or district educational administrators have over schools determines the number and nature of supervisory tasks performed by the educational administrators. This in turn determines the type of data items required by them for an effective management of schools. For instance, in some countries, all school teachers are recruited centrally by the national, provincial or district education offices and allocated to schools according to a predetermined staffing standard. In the other extreme, in some countries, for some types of public-sector schools, the number of teachers and the recruitment of teachers are entirely in the hands of the school principals. In both cases, the jobs of the educational administrators would be very difficult, and the data items required would also be different, at least in the level of details required on the teaching staff of schools.

4.1.4 What are discussed in the following paragraphs represent only a very tentative idea of certain data items that could be used to help educational administrators in carrying out their supervisory duties. This is due to the limitations imposed by the statistics available to create the

data files for demonstration. However, it is hoped that this shortcoming could provide an opportunity for:

(a) the trainees to participate ACTIVELY in suggesting modifications and additions to the training materials; and

(b) the instructors to demonstrate how these additional requirements could be coped with in the computer system design.

4.1.5 There are functions which invariably would fall into the category of supervisory duties of the educational administrators. These are as follows:

(a) Whether schools are properly staffed?

It is necessary to ensure that schools have:

(1) The right number of teachers, by relating the number of classes or pupils in the school concerned to the number of teachers available. The usual data items required to monitor this are:

- the number of teachers available, and
- the number of teachers the school is entitled to according to the agreed teacher/class ratio or pupil/teacher ratio;

(2) Teachers of the right qualifications, by ensuring that either all or a specified proportion of teachers in the school concerned are qualified. The usual data items required to monitor this are:

- the distribution of teachers by qualifications, or to be more concise
- the proportion of qualified teachers

(3) Teachers of the right kind, by ensuring schools are staffed with teachers of the right subject-mix (which is more important at the secondary level) or of the right grade (in the case of primary education in Indonesia, it is suggested to classify teachers into Head, Class, Religion and Sport/Art teachers). For this, the data item is surely:

- the number of teachers by grade

(b) Whether schools are properly equipped?

This would entail the following questions to be asked:

(1) Whether schools have the required number of classrooms and special rooms (such as library, laboratories, etc.)?

(2) Whether schools have the required amount of open space and playground area for the children?

(3) Whether the conditions of classrooms, special rooms and the school building in general are satisfactory?

Since statistical information is not available on the above questions, it is therefore not proposed to go into detail concerning the data items required to monitor whether schools are properly equipped. The instructors should encourage the participants to bring their data sheets on the above subject matter to the training sessions, so that a data file on schools could be constructed during the training session to show how statistics could be compiled to provide the necessary management information to educational administrators in performing the above tasks.

(c) Whether schools are properly financed?

This involves comparing the amount of subsidy or financial resources available to the school concerned with the amount which the school is entitled to according to the national, provincial, or district standards. This amount would depend on the number of pupils, the number of operating classes, etc., that the school has. The data items required are:

(1) the amount of financial resources available to the school, as compared to,

(2) the amount of financial resources the school is entitled to, having regards to the number of classes and pupils in the school concerned.

No information is available on the financial resources available to the schools. Therefore, in the practical demonstration, only a rough method of calculating school entitlement will be shown.

(d) Whether schools are properly enrolled?

The rationale for this supervisory function reflects the concern of the educational administrators on the utilization of school resources. If schools are under-enrolled, it amounts to an underutilization of the

school building and the land, if not the teachers. It could be argued that a reduced enrollment would result in a reduction in the class size, and hence could lead to an improvement in the quality of education. Regardless of whether this argument has theoretical and empirical foundation, it is clearly not the wish of planners and administrators to see that qualitative improvements are brought about in this haphazard manner. The data items which could be used to monitor this are:

(1) the class size of the school;

(2) the ratio of Primary 1 applicants to the number of Primary 1 place available;

(3) the number and the proportion of classrooms which are vacant.

As no statistics are available on the number of vacant classrooms for designing the practical demonstrations for (3) above, this data item will be included in the practical session of this Unit.

4.1.6 Advisory Activities. What has been discussed above is related to the resource inputs and utilization of schools. The ultimate and primary concern of planners and administrators is obviously not on these factors, but rather on the quality of the teaching and learning processes in the classrooms. This quality issue in turn is related to the questions of:

(a) Whether activities in schools and classrooms are conducted in an effective manner conducive to learning;

(b) Whether the school environment promotes effective teaching and learning.

In some countries, the education ministry or the district level education officers assume an active role in advising schools on such matters as curriculum design, teaching methods, etc. In others, these are either left to the discretion of individual school heads or teachers, or largely influenced by the examination system, or other authorities responsible for selection to tertiary institutions. In either case, the central, provincial and district educational administrators would seldom want to relinquish their interest or influence, however marginal, over this qualitative aspect of school administration.

4.1.7 Most of the information required for this kind of advisory activity is qualitative in nature. For example, the educational administrators would need to have a list of

the textbooks used in the schools, the timetable adopted and possibly the examination, testing and class promotion standards enforced. In addition, some may require schools to inform them how they stream, set, or group students of different abilities and learning needs.

4.1.8 Quantitative information that is often collected is the examination scores. Occasionally, the educational administrators may conduct the so-called standardized tests in schools, in order to monitor the performance of pupils, as well as schools, on a number of selected subjects. This kind of quantitative information however is not available from the usual statistical surveys of schools. In any case, it is not available to the author in designing the practical exercises.

4.1.9 As a result, the author has to rely on some indirect statistical measures which could serve as a sort of indicator for the educational administrators in identifying schools that might require attention. For example, if a particular school has a less than average input of resources, the quality of teaching may suffer. If a school has a higher than normal rate of repetition, then one might suspect that something has gone wrong in the teaching-class process in that school. Thus, the following so-called qualitative measures are proposed to be used to help administrators in carrying out their advisory activities:

(a) the rate of repetition;

(b) the proportion of Primary 6 leavers passing the final examination

both of which are indicators of the performance of the students, and

(c) the average class size;

(d) the pupil/teacher ratio; and

(e) the proportion of unqualified teachers.

which are indirect indicators on the quality of education for the schools concerned.

## 4.2 Project Management

4.2.1 Project management encompasses a whole range of activities from the formulation of a project or a programme of projects, to the implementation and evaluation of the projects(s). Projects are, put in the simplest terms, the means to put into action an education policy. Thus, project

management in fact immediately follows the formulation of an education plan. As distinction between the various phases of the planning, budgeting and implementation process is often difficult to draw, it is not the purpose of this module to go into details about the various components which should constitute project management.

4.2.2 What the author would want to highlight is that for any education plan, there are bound to be different activities that have to be carried out in a coordinated manner. Yet these activities could be quite different in nature, and would most likely be implemented by different ministries, or different divisions within the education ministry, or by different regional or district education offices or other agencies. Take for example the policy to provide universal junior secondary education for the country at a certain date. In order to achieve this policy, it is necessary to:

(a) Build sufficient number of junior secondary schools to provide the required number of classrooms;

(b) Train sufficient number of teachers, or retrain some of the existing teachers to staff the new schools or additional classes in existing schools;

(c) Design the curriculum for children coming from a different "ability group" or background, and to provide for the required textbooks, ETV programmes, etc.;

(d) To draw up a system of allocating pupils to different schools or types of schools;

(e) To procure the necessary financial, physical, as well as human resources (other than teachers, e.g., administrators and researchers) for the implementation of the above.

Each of the above could be conceived as a programme of projects, and would be the responsibility of a large number of personnel in the education ministry, ministries responsible for finance and public works programmes, the local authorities, etc. In order to ensure the successful implementation of the policy on the provision of universal junior secondary education, all of the above programmes have to be carried out according to plan. Any slippage in the teacher training programme would severely affect the implementation of this policy.

4.2.3 Thus, one of the main concerns of educational planners and administrators is to ensure that all the programmes or projects are implemented according to plan. In

addition, there is also the concern of whether resources are utilized efficiently and effectively in the projects. All these amount to ensuring that the projects are effectively managed. Normally, this should be the responsibility of the so-called "project manager" of the projects. The management tasks involve:

(a) the monitoring of the timing of the project;

(b) the control over the financial spending;

(c) the supervision over the technical aspects of the projects.

Taking the example of the school building programme, the tasks of managing any one school project in the building programme include overseeing the land acquisition process which may involve the clearance or legal or illegal inhabitants of the land, the site formation work, the design of the school building if there is no standard plan, the progress of construction work, the drawing up of the list of furniture and equipment and the acquisition of these items, the setting up of the school management body, the appointment of school heads and teachers, and finally, the enrollment of pupils. Obviously, some of these tasks fall outside the jurisdiction if not as well beyond the competence of educational planners and administrators.

4.2.4 Therefore, for the purpose of this module, the whole range of activities involved in project management would not be discussed. These should be left to the "project manager" or the team of professionals and administrators from different disciplines, depending on the nature of the projects. What is important and relevant to the educational planners and administrators is:

(a) The monitoring of the progress of the projects;

(b) The initiation of any remedial actions or modifications to the original plan or design required to be taken to ensure the smooth implementation of the projects.

To do this requires the availability of information on the progress of the projects and on the problems encountered in the implementation of the projects.

4.2.5 The information required can be classified into two main types:

(a) Financial data which would be the amount budgeted for the project, the amount committed, and the amount actually spent. The data provide quickly a rough idea

about the progress of the project. Caution, however, is required in the use of such information. There may be considerable time lag in the claiming of bills by the contractors;

(b) Data on physical targets completed which are more difficult to define. For a simple project like a school building project, the data could be the number of classrooms completed, or the stages of building work done (say the school project could be broken down into several stages like land acquisition, site formation, construction of classroom block, construction of other parts of the school building, etc.). For a project on eradicating illiterates in rural areas, the results of progress would be much more difficult to assess. Thus, different kinds of projects would call for different types of data.

In addition, the above data would be viewed in a "time" dimension. A very convenient yardstick is the comparison of the planned target date with the expected date of completing the project.

4.2.6 Monitoring of School Projects. In view of the diversity in the nature of projects, it is proposed to use the monitoring of school projects as an example or illustration of some of the techniques used in the use of information for monitoring purposes. This involves:

(a) The design of a reporting procedure for the necessary information to be fed back to the educational administrators and planners. Two points need to be considered here:

(1) The data items required, which may include the following:

- the project reference which relates the school project to the budget reference number and the programme reference number;
- the project reference number which helps to identify the project in question;
- the project number;
- the location of the project;
- the target date of commencing work for the project;
- the target date of completion for the project;
- the number of classrooms available from the school project;
- the amount of money budgeted for the project;
- the name of officer/agency responsible for the project;

Most of the above items normally do not change and hence do not need to be regularly updated;

- the stage of progress of the project which may be divided into:
  - acquisition of land
  - preparation/approval of layout plan
  - cost estimate for the project
  - approval of necessary funds
  - appointment of building contractor
  - site formation & piling
  - construction of classroom block
  - construction of other parts of building
  - inspection of completed building
  - fitting out
  - furniture and equipment
  - setting up of school management body
  - appointment of school head and recruitment of teachers
  - enrollment of pupils

Some of the above stages may be undertaken concurrently;

- amount of money committed;
- amount of money spent;
- additional financial provision required for the completion of the project, if applicable;
- expected date of completion of the project;

All of the above information has to be updated at regular intervals.

(2) The flow of information from those responsible for the day-to-day management of the projects to the central, provincial, or district educational administrators has to be arranged. Usually, most of the information is made available when the project manager applies for the commitment and use of the budgeted funds. However, such kind of information may only be made available to those who control the public purse. Therefore, special arrangement may have to be made, usually in the form of questionnaire surveys, to collect updated information on the progress of the projects.

(b) The creation of the information system for storing, processing and retrieving the data collected. This can be done in the form of a project information data file, following the procedure adopted discussed in Module II:

(1) The design of the data collection form as per Figure XX below;

(2) The collection of data from the project managers by asking them to submit on a regular basis, updated returns on the progress of the projects under their control. In order to simplify the job of the project manager in completing the questionnaires, it is not necessary for the project manager to fill in data items which do not change very often. Such information items could automatically be printed on the questionnaire by extracting the necessary data items from the data base;

(3) The creation of the data base on the projects, based on information supplied by the project managers.

(c) The compilation of the relevant statistical information from the data base. Basically, the information required for the monitoring of the projects include:

(1) The amount of funds spent as compared with the amount of funds budgeted. This gives the amount of funds left for the projects. If the amount left is small compared with the stage of progress of the project, something has to be done to find out the reasons and to rectify the situation, if required;

(2) Related information is the additional financial provision estimated to be required for the completion of the project. This is an indication that urgent remedial action is required by all concerned;

(3) The expected date of completion of the project as compared with the target date of completion as a very convenient indicator of the progress of the project.

Once the data base is set up, other information stored in the data file could easily be made available. For example, if a school project is found to have been delayed, information on the stage of progress could provide indication as to where the slippage has occurred, so that the educational administrators could approach the appropriate officers/agencies for remedial action.

4.2.7 Apart from helping the educational administrators in monitoring the progress of school projects, the data base could also be used for other planning activities, for example:

(a) school mapping exercises for determining the location of new schools;

(b) the planning of teacher training and deployment, as the number of new schools to be completed in a particular locality would affect the number of teachers required to be trained and deployed to that locality;

(c) the planning of pupil selection and allocation, as the number of new schools to be opened in any school year would partly determine the number of children that can be admitted in a particular district. If there is a centralized system of selecting and allocating pupils to schools, then this system has to take into account the changing distribution of school places arising from new schools completed.

Some of the uses of the school project data base will be demonstrated in Module IV on the Use of the Education Management Information System for Planning.

## 5. User Manual

### 5.1 Getting Started

5.1.1 The user manual is designed for:

(a) The instructors in demonstrating how to put into practice the various points discussed in the section on Instructor Activities, making use of the education management information system on pupils, teachers, and schools;

(b) The trainees in practicing the procedures suggested in retrieving, processing, and summarizing data from the education management information system for the routine administration of schools and projects.

While the programming steps and commands suggested would enable the participants to produce the kinds of management information required, it is suggested that the instructors and trainees should attempt to apply other techniques and to modify some of the procedures suggested in this User Manual in order to exploit to the full the potentials of the management information system.

5.1.2 The practical exercises suggested in this section are based on the data base software package DBASE III (version 1.1 or 2) and the utility program QUICKREPORT. These two packages can be run on any IBM PC or EX or its compatible, operating on PCDOS or MSDOS 2.0 or above, with at least 256 K bytes of RAM, 2 double sided floppy disk drives or 1 double sided disk drive and a hard disk.

5.1.3 It is recommended to boot up the microcomputer using the CONFIG.SYS file to reserve 20 file and 24 disk buffers (the default values are 8 and 2 respectively). The data bases on pupil stock, pupil flow, teachers, and schools are based on the ones constructed in Module II. They are stored in the Diskette "EPP Mod.v.3":

(a) Pupil stock file: PUPIL_RC.DBF
(b) Pupil flow file: FLOW_RC.DBF
(c) Teacher file: TEA_RC.DBF
(d) School master: SCHMAS.DBF

Their corresponding index files created in Module II have not been copied to this Diskette because it is planned to set up another set of index files for these four data bases. There are other files contained in this Diskette which are created when this User Manual Section is designed. All these files have been protected against accidental deletions and modifications by being converted into read only files. It is therefore necessary to make a backup copy of the Diskette (using the DOS command COPY *.*) and use the backup for the practical exercises.

5.1.4 In starting up the system, it is recommended to place the Diskette "EPP Mod.v.3" in Drive A, and start up the software (e.g., DBASE III) from Drive C or Drive B.

## 5.2 Administration of Schools

5.2.1 In this subsection, a number of programming steps are suggested for compiling the required management statistics. These steps make use of DBASE III commands at command level. These steps are more complicated than the ones shown in Module II, and the manipulation of multiple data bases will be demonstrated in chis subsection. For ad hoc queries of the data base, these commands should be quite sufficient. However, working at dot prompt is not quite efficient if the data base is large and the processing and manipulation of the data are done repeatedly on the same data base. For example, the REPLACE command will cause the system to read through the data base once. If more than one REPLACE commands are executed together with other commands like SUM, the system has to read through the data base many times. To overcome this limitation requires the user to write his own programme.

It is not proposed, for the time being, to introduce programming in this Module. The purpose of the approach adopted here is to demonstrate how users can communicate with the microcomputer. For provincial planners and administrators who do not need to handle very large data bases, this approach should not be inappropriate.

5.2.2 Supervisory Activities. A number of functions have been identified as part of the supervisory duties of the central, provincial, or district educational administrators. The following will go through some of these for which data are available to permit the design of the practical exercises, showing how the management statistics could be compiled from the information system on pupils, teachers, and schools:

(a) Staffing of Schools. One of the jobs of the educational administrators is to identify schools which have problems in staffing, in respect of:

(1) Whether the number of teachers available is adequate based on the approved staffing standards;

(2) Whether the teachers are qualified or not;

(3) Whether the mix of the teachers is right or not (as no information is available on the number of teachers by subject, only the grade of teachers is examined).

(b) The following gives the step-by-step procedures in retrieving the required management information for the question (a)(1) above:

(1) As the information required includes that on the number of classes and pupils in the schools which are stored in the PUPIL_RC data base, and that on the number of teachers in the schools which is stored in the TEA_RC data base, it is necessary to retrieve information simultaneously from the two data bases. Accessing two data files calls for the need to "link" the two files together, using an index field common to the two files. This index field is the SCH_CODE which can uniquely identify the school and is included in both the PUPIL_RC and TEA_RC data bases.

(2) One of the approaches that can be adopted is to use the command SET RELATION TO. The procedure which can be followed is shown below. It should be noted that all DBASE III commands are written in UPPER case beginning with an asterisk (*).

After starting up DBASE III, at dot prompt:

- *SET DEFAULT TO A to tell the system to look for the files in Drive A;

- *SELECT 1 to assign a working area 1 for one data base. DBASE III system allows 10 work areas for data bases;

- *USE PUPIL_RC to open the data base PUPIL_RC in work area 1;

- As not all the fields in PUPIL_RC will be required in this exercise, and to avoid changing the data base which may be used for other purposes, it is recommended to create a copy of PUPIL_RC with only the required fields. This is done by:

  *COPY TO PUPIL2 FIELDS SKA,SKE,SE,C1,C2,C3,C4, C5,C6,EA6,ET,SCH_CODE.

  The field EA6 which stands for the enrollment aged 6 or below, is only copied. This field will be used to store the total number of classes, as it is not convenient to refer to (c1+c2+c3+c4+c5+c6) in subsequent data manipulation;

- *USE PUPIL2 ALIAS PU2
  *DISPLAY STRUCTURE, and the following should show up on the screen:

Figure I: Structure for Data Base PUPIL2

```
Structure for data base:  A:pupil2.dbf
Number of data records:   65
Date of last update:      08/17/86
Field  Field Name    Type         Width      Dec
    1  SKA           Character        2
    2  SKE           Character        2
    3  SE            Character        3
    4  C1            Numeric          2
    5  C2            Numeric          2
    6  C3            Numeric          2
    7  C4            Numeric          2
    8  C5            Numeric          2
    9  C6            Numeric          2
   10  EA6           Numeric          4
   11  ET            Numeric          4
   12  SCH_CODE      Character       12
**Total**                           40
```

- To compute the total number of classes and store the value in EA6,
  *REPLACE ALL EA6 WITH C1+C2+C3+C4+C5+C6;

- To open the teacher file TEA_RC and assign it to work area 2,
  *SELECT 2
  *USE TEA_RC;

- *COPY TO TEA2 FIELDS SKA,SKE,SE,TT,SCH_CODE, NHT,NCT,NRT,NST,GTT so that a duplicate of TEA_RC is also created with only the fields required;

- *SELECT 2
  *USE TEA2 ALIAS TE2
  *DISPLAY STRUCTURE, and the following should appear on the screen:

Figure II: Structure of Data Base TEA2

```
Structure for data base:    A:tea2.dbf
Number of data records:     67
Date of last update:        09/17/86
Field  Field Name   Type        Width      Dec
    1  SKA          Character       2
    2  SKE          Character       2
    3  SE           Character       3
    4  TT           Numeric         3
    5  SCH_CODE     Character      12
    6  NHT          Numeric         2
    7  NCT          Numeric         2
    8  NRT          Numeric         2
    9  NST          Numeric         2
   10  GTT          Numeric         3
**Total**                         34
```

- In order to "link" the two data bases, it is necessary to index the first on the common index field. Indexing the second is always recommended for file management of this sort:

  *SELECT 1
  *INDEX ON SCH_CODE TO PU2
  *SELECT 2
  *INDEX ON SCH_CODE TO TE2

- The two data bases can be linked by SET RELATION command. After the relation has been

set, one can display, print, transfer data items in the two data bases linked. SET RELATION is most useful when each record in one data base matches one and only one record in another data base.

```
*SET RELATION TO SCH_CODE INTO PU2
*REPLACE ALL GTT WITH PU2->ET/35
```

The above commands calculate the teacher requirements for each school, which will be stored in the field GTT in the TE2 data base, using a hypothetical pupil/teacher ratio of 35. Based on this ratio, the number of teachers required is equal to total enrollment divided by 35 (or ET in the data base PUPIL2 divided by 35).

Once the number of teachers required is calculated and is sorted in the field GTT in the TEA2 data base, also named TE2 in the USE command, schools which are understaffed can be identified by comparing the number required (GTT) with the number available (field TT in the TEA2 data base):

*DISPLAY SCH_CODE,TT,GTT FOR TT<GTT will give the following results:

| Record# | sch_code | tt | gtt |
|---|---|---|---|
| 18 | 101230502002 | 3 | 4 |
| 24 | 101230502008 | 4 | 5 |
| 28 | 101230502012 | 7 | 10 |
| 32 | 101230502016 | 5 | 10 |
| 35 | 101230504002 | 6 | 7 |
| 63 | 102230501039 | 7 | 8 |

Alternatively, the teacher requirement can be calculated using the teacher/class ratio of say 1:2. Similar procedures may be adopted to find out schools which are understaffed:

```
*REPLACE ALL GTT WITH PU2->EA6*1.2
*DISPLAY SCH_CODE,TT,GTT FOR TT<GTT
```

and the following should show up on the screen or if desired on the printer by directing the output to the line printer:

| Record# | sch_code | tt | gtt |
|---|---|---|---|
| 48 | 101230501004 | 9 | 10 |
| 52 | 101230501008 | 11 | 12 |
| 17 | 101230502001 | 6 | 7 |
| 18 | 101230502002 | 3 | 7 |
| 19 | 101230502003 | 5 | 6 |
| 20 | 101230502004 | 6 | 24 |
| 23 | 101230502007 | 5 | 7 |
| 24 | 101230502008 | 4 | 7 |
| 25 | 101230502009 | 3 | 6 |
| 26 | 101230502010 | 5 | 7 |
| 27 | 101230502011 | 6 | 8 |
| 30 | 101230502014 | 6 | 8 |
| 32 | 101230502016 | 5 | 10 |
| 35 | 101230504002 | 6 | 8 |
| 37 | 101230504004 | 6 | 7 |
| 38 | 101230504005 | 5 | 7 |
| 42 | 101230504009 | 6 | 7 |
| 43 | 101230504010 | 6 | 7 |
| 44 | 101230504011 | 1 | 5 |
| 57 | 102230501033 | 10 | 12 |
| 62 | 102230501038 | 10 | 11 |
| 63 | 102230501039 | 7 | 8 |
| 64 | 102230501040 | 6 | 7 |
| 66 | 102230501042 | 9 | 10 |

More complicated calculations may be introduced into the excercise. For instance, if the staffing standards adopted for Indonesian primary schools are used, then the REPLACE command may be used several times. It is understood that the staffing standards are as follows:

Figure III: Staffing Standards in Primaries

| No. of Pupils | No. of Classes | No. of Teachers | | | | |
|---|---|---|---|---|---|---|
| | | Head | Class | Rel. | Sports | Total |
| >360 | >10 | 1 | >10 | 1 | 1 | >13 |
| 101-360 | 6-9 | 1 | 6-9 | 1 | 1 | 9-12 |
| 91-100 | 6 | 1 | 5 | 1/2 | 1/2 | 7 |
| 61-90 | 6 | 1 | 3 | 1/2 | 1/2 | 5 |

Then the procedure that may be followed is given below:

```
*REPLACE ALL GTT WITH PU2->EA6+3 FOR
 PU2->ET>180
```

```
*REPLACE ALL GTT WITH 7 FOR
 PU2->ET>90 .AND. PU2->ET<181
*REPLACE ALL GTT WITH 5 FOR
 PU2->ET>60 .AND. PU2->ET<91
*REPLACE ALL GTT WITH 4 FOR PU2->ET<61
```

and this will give the teacher requirement for schools of different enrollment size, and to identify schools which are understaffed *DISPLAY SCH_CODE,TT,GTT FOR TT<GTT will give the following results:

| Record# | sch_code | tt | gtt |
|---|---|---|---|
| 47 | 101230501003 | 10 | 11 |
| 48 | 101230501004 | 9 | 11 |
| 50 | 101230501006 | 7 | 9 |
| 51 | 101230501007 | 7 | 9 |
| 52 | 101230501008 | 11 | 13 |
| 55 | 101230501011 | 6 | 7 |
| 17 | 101230502001 | 6 | 7 |
| 18 | 101230502002 | 3 | 7 |
| 19 | 101230502003 | 5 | 7 |
| 20 | 101230502004 | 6 | 7 |
| 24 | 101230502008 | 4 | 7 |
| 25 | 101230502009 | 3 | 7 |
| 27 | 101230502011 | 6 | 10 |
| 28 | 101230502012 | 7 | 9 |
| 29 | 101230502013 | 6 | 7 |
| 30 | 101230502014 | 6 | 7 |
| 32 | 101230502016 | 5 | 11 |
| 4 | 101230503005 | 7 | 9 |
| 5 | 101230503006 | 7 | 9 |
| 34 | 101230504001 | 7 | 8 |
| 35 | 101230504002 | 6 | 10 |
| 37 | 101230504004 | 6 | 9 |
| 38 | 101230504005 | 5 | 7 |
| 42 | 101230504009 | 6 | 7 |
| 43 | 101230504010 | 6 | 7 |
| 44 | 101230504011 | 1 | 4 |
| 57 | 102230501033 | 10 | 13 |
| 58 | 102230501034 | 10 | 11 |
| 61 | 102230501037 | 9 | 10 |
| 62 | 102230501038 | 10 | 12 |
| 63 | 102230501039 | 7 | 10 |
| 64 | 102230501040 | 6 | 7 |
| 65 | 102230501041 | 8 | 10 |
| 66 | 102230501042 | 9 | 11 |

(c) For the question (a)(2) above, one method is to examine the distribution of teachers by different qualifications. Since there are some 8 different

categories of qualifications in the TEA_RC data base, a shortcut is to look at the proportion of unqualified teachers. With the proportion calculated for each record in the TEA_RC data base, schools with an unacceptable percentage of unqualified teachers can easily be identified from the data base. The approach which may be adopted is as follows:

(1) Since all the data items required are already stored in the TEA_RC data base, no linking of data files is required;

(2) The procedure that may be adopted is as follows:

- *USE TEA_RC
  *REPLACE ALL NQT WITH NQT/NPT*100 FOR NPT>0

  to compute the percentage of unqualified teachers and stored in the field NQT (which is originally equal to NP1+NP3+NP5 in the TEA_RC data base);

- To shortlist schools with a nonzero percentage of unqualified teachers:

  *DISPLAY SCH_CODE,NP1,NP3,NP5,NQT FOR NQT>0

  and the following should appear on the screen:

| Record# | sch_code | np1 | np3 | np5 | npt | nqt |
|---|---|---|---|---|---|---|
| 65 | 102230501041 | 0 | 0 | 7 | 8 | 88 |

(d) As regards (a)(3) above, it is proposed to look at just the grade of teachers in each school to see if there is a mismatch between what are available and what should be available according to the standards. The following procedure may be adopted to retrieve the management statistics required to monitor this:

(1) Since the data items required for this (which include the number of classes and enrollment, and the number of teachers abailable by grade) are stored in two different data bases (PUPIL_RC and TEA_RC), it is necessary to link the two data bases together:

```
*SELECT 1
*USE PUPIL_RC ALIAS PUPIL
*INDEX ON SCH_CODE TO PUPIL_RC
*SELECT 2
*USE TEA_RC
*INDEX ON SCH_CODE TO TEA_RC
```

```
*SET RELATION TO SCH_CODE INTO PUPIL
```

(2) To identify schools with enrollment exceeding 180 and which are not staffed with a religion teacher, one may issue the following commands:

```
*DISPLAY SCH_CODE,TT,NRT FOR NRT=0 .AND.
 PUPIL->ET>180
```

and the following should show up on the screen:

| Record# | sch_code | tt | nrt |
|---|---|---|---|
| 32 | 101230502016 | 5 | 0 |

(3) To find out which schools with an enrollment of 181 pupils or more, which are not staffed with sufficient numbers of religion and sports teachers, the following commands may be used:

```
*DISPLAY SCH_CODE,TT,NRT,NST FOR
 NRT+NST<2 .AND. PUPIL->ET>180
```

and the following would appear on the screen:

| Record# | sch_code | tt | nrt | nst |
|---|---|---|---|---|
| 3 | 101230503004 | 10 | 1 | 0 |
| 4 | 101230503005 | 7 | 1 | 0 |
| 5 | 101230503006 | 7 | 1 | 0 |
| 8 | 102230503009 | 9 | 1 | 0 |
| 27 | 101230502011 | 6 | 1 | 0 |
| 28 | 101230502012 | 7 | 1 | 0 |
| 32 | 101230502016 | 5 | 0 | 1 |
| 47 | 101230501003 | 10 | 1 | 0 |
| 48 | 101230501004 | 9 | 1 | 0 |
| 50 | 101230501006 | 7 | 1 | 0 |
| 52 | 101230501008 | 11 | 1 | 0 |
| 54 | 101230501010 | 10 | 1 | 0 |
| 56 | 102230501032 | 9 | 1 | 0 |
| 61 | 102230501037 | 9 | 1 | 0 |
| 63 | 102230501039 | 7 | 1 | 0 |
| 66 | 102230501042 | 9 | 1 | 0 |

(4) In order to find out which schools have less than the required number of class teachers, it would be required to relate staffing standards shown in Figure III above to the total number of classes and enrollment. The two variables are conveniently stored in the PUPIL2 data base. Hence, the TEA_RC and PUPIL2 data files have to be linked:

```
*SELECT 1
*USE PUPIL2 ALIAS PU2
*INDEX ON SCH_CODE TO PU2
*SELECT 2
*SET RELATION TO SCH_CODE INTO PU2
```

(5) To display schools with an enrollment of 181 pupils or more, which are staffed with insufficient numbers of class teachers, the following procedure may be adopted:

```
*DISPLAY SCH_CODE,TT,NCT,PU2->EA6 FOR
 NCT<PU2->EA6 .AND. PU2->ET>180
```

and the following records would appear on the screen:

| Record# | sch_code | tt | nct | pu2->ea6 |
|---|---|---|---|---|
| 4 | 101230503005 | 7 | 5 | 6 |
| 5 | 101230503006 | 7 | 5 | 6 |
| 27 | 101230502011 | 6 | 4 | 7 |
| 28 | 101230502012 | 7 | 5 | 6 |
| 31 | 101230502015 | 10 | 5 | 7 |
| 32 | 101230502016 | 5 | 3 | 8 |
| 34 | 101230504001 | 7 | 3 | 5 |
| 35 | 101230504002 | 6 | 3 | 7 |
| 37 | 101230504004 | 6 | 3 | 6 |
| 48 | 101230501004 | 9 | 7 | 8 |
| 50 | 101230501006 | 7 | 5 | 6 |
| 51 | 101230501007 | 7 | 4 | 6 |
| 52 | 101230501008 | 11 | 9 | 10 |
| 57 | 102230501033 | 10 | 7 | 10 |
| 58 | 102230501034 | 10 | 7 | 8 |
| 62 | 102230501038 | 10 | 7 | 9 |
| 63 | 102230501039 | 7 | 5 | 7 |
| 65 | 102230501041 | 8 | 5 | 7 |
| 66 | 102230501042 | 9 | 7 | 8 |

(6) To find out whether the above schools are also understaffed as far as the total number of teachers is concerned, a further condition needs to be set to select only those schools which are understaffed. Apart from the FOR option, another method is to use the SET FILTER TO option. With this option, the records in the data base are filtered so that only those which meet the specified conditions will be available for display. This option can be turned off by issuing the command SET FILTER TO but without any conditions following the command.

```
*SET FILTER TO PU2->ET>180
*DISPLAY SCH_CODE,TT,NCT,PU2->EA6,PU2->ET FOR
 NCT<PU2->EA6 .AND. TT<PU2->EA6+3
```

and the following will show up on the screen:

| Record# | sch_code | tt | nct | pu2->ea6 | pu2->et |
|---|---|---|---|---|---|
| 4 | 101230503005 | 7 | 5 | 6 | 235 |
| 5 | 101230503006 | 7 | 5 | 6 | 188 |
| 27 | 101230502011 | 6 | 4 | 7 | 182 |
| 28 | 101230502012 | 7 | 5 | 6 | 346 |
| 32 | 101230502016 | 5 | 3 | 8 | 352 |
| 34 | 101230504001 | 7 | 3 | 5 | 208 |
| 35 | 101230504002 | 6 | 3 | 7 | 229 |
| 37 | 101230504004 | 6 | 3 | 6 | 200 |
| 48 | 101230501004 | 9 | 7 | 8 | 249 |
| 50 | 101230501006 | 7 | 5 | 6 | 182 |
| 51 | 101230501007 | 7 | 4 | 6 | 220 |
| 52 | 101230501008 | 11 | 9 | 10 | 327 |
| 57 | 102230501033 | 10 | 7 | 10 | 269 |
| 58 | 102230501034 | 10 | 7 | 8 | 287 |
| 62 | 102230501038 | 10 | 7 | 9 | 235 |
| 63 | 102230501039 | 7 | 5 | 7 | 275 |
| 65 | 102230501041 | 8 | 5 | 7 | 229 |
| 66 | 102230501042 | 9 | 7 | 8 | 267 |

(e) The Finance of Schools. As no information is available on the amount of financial resources available to the schools for designing the practical exercise, this subsection only demonstrates a method of calculating the amount of subsidy that should be made available to schools of different size, based on the approved standards. The subsidy standards which are adopted in the practical exercises are as follows:

Figure IV: Annual Recurrent Subsidy for Primaries

| Nature of Subsidy | Basis of Calculation | Amount (Rp) |
|---|---|---|
| (1) Operation Costs | per pupil | 300 |
| | per class | 10000 |
| (2) Administration | per class | 8000 |
| (3) Maintenance | per school | 25000 |
| (4) Employee Welfare | per headmaster (public school) | 30000 |
| | per teacher | 30000 |
| (5) School Garden | per school (public school) | 24000 |
| (6) Sports & Arts | per school (public school) | 10000 |

| | | | |
|---|---|---|---|
| (7) | Supervision/ Progress Reports | per school (public school) | 5000 |
| (8) | Data Collection | per school | 5000 |

In the practical exercises, information in the data bases will be manipulated according to the above standards. It should be noted that following more or less the same procedures demonstrated in this subsection, different standards of calculating recurrent subsidy to schools can be used. It is suggested that the instructors should try to obtain information on any other methods of calculating recurrent subsidy, and then demonstrate how to arrive at a new set of figures based on these other methods.

(f) It may be noted from Figure IV above, information has to be retrieved from both the teacher (TEA_RC) and the pupil (PUPIL_RC) data bases. This means that the two data bases have to be linked. In addition, it may have already been discovered in the previous subsection on the staffing of schools, that the information displayed on the screen is not quite adequate in that the names of the schools are not displayed. To display school names would link to a third data base, namely the school master file (SCHMAS). The SET RELATION command does not permit the setting of more than one relationship at a time. There could be a number of ways of overcoming this restriction, for example:

(1) To design a program with a number of subroutines each to accommodate a SET RELATION command;

(2) Or to use the JOIN command to join two data files together to form a new data file. This is one of the most powerful DBASE III commands for handling multiple data bases. The JOIN command may also be used to join two data bases to form a new one for reporting purposes, as the DBASE III report generator does not support the use of more than one data base. Using the JOIN command could be quite time-consuming, as the DBASE III system will search the two data bases sequentially, comparing one record in the first data base with all records in the second data base and merging those which satisfy the selection conditions with the record in the first data base. Hence, if large data bases are involved, the JOIN command should only be used when necessary.

(g) Method (f)(2) will be adopted in this subsection and the

following gives the procedure that could be used.

(1) *USE PUPIL2 to open the pupil2 file created in the previous subsection. As not all the data fields are required in this exercise, and as it is planned to include information on the amount of recurrent subsidy required, the structure of the data file is modified using the MODIFY STRUCTURE command. The new data structure for PUPIL2 is as follows:

Figure V: Revised Structure for PUPIL2

```
Structure for data base:    A:pupil2:dbf
Number of data records:     65
Date of last update:        08/18/86
Field  Field Name   Type         Width      Dec
    1  SKA          Character        2
    2  SKE          Character        2
    3  SE           Character        3
    4  EA6          Numeric          4
    5  ET           Numeric          4
    6  SCH_CODE     Character       12
    7  SUB_PU       Numeric         10
    8  SUB_CL       Numeric         10
    9  SUB_SCH      Numeric         10
   10  SUB_TEA      Numeric         10
   11  TSUB         Numeric         10
** Total **                         78
```

The new fields are in respect of:

- the subsidy for pupil (SUB_PU);
- the subsidy for class (SUB_CL);
- the subsidy for school (SUB_SCH);
- the subsidy for teachers (SUB_TEA);
- the total subsidy (TSUB).

(2) To create a new data base with the school name, one can join the SCHMAS with PUPIL2:

```
*SELECT 2
*USE SCHMAS
*JOIN WITH PUPIL2 TO SCH1 FOR
 PUPIL2->SCH_CODE = SCH_CODE
*USE SCH1
*DISPLAY STRUCTURE
```

and the following should appear on the screen:

Figure VI: Structure for SCH1

```
Structure for data base:     A:sch1:dbf
Number of data records:      45
Date of last update:         08/18/86
Field  Field Name   Type         Width      Dec
    1  ST           Character        2
    2  SS           Character        1
    3  SP           Character        2
    4  SKA          Character        2
    5  SKE          Character        2
    6  SE           Character        3
    7  SCH_CODE     Character       12
    8  NAME         Character       30
    9  ADDRESS      Character      100
   10  EA6          Numeric          4
   11  ET           Numeric          4
   12  SUB_PU       Numeric         10
   13  SUB_CL       Numeric         10
   14  SUB_SCH      Numeric         10
   15  SUB_TEA      Numeric         10
   16  TSUB         Numeric         10
** Total **                       213
```

It may be noted that not all records in the two data bases are matched. Apparently, there are some errors in the codes which are probably due to manual errors during the data input stage when the pupil (PUPIL_RC) and school master (SCHMAS) files are created.

(3) To calculate the amount of recurrent subsidy based on the number of teachers, it is necessary to link SCH1 with the TEA_RC data base.

```
*SELECT 2
*USE TEA_RC INDEX TEA_RC
*SELECT 1
*SET RELATION TO SCH_CODE INTO TEA_RC
*REPLACE ALL SUB_TEA WITH TEA_RC->TT*30000
```

(4) To calculate other subsidies based on the number of classes and pupils, the following procedure may be adopted:

```
*REPLACE ALL SUB_SCH WITH
 25000+30000+24000+10000+5000+5000 FOR SS="1"
*REPLACE ALL SUB_SCH WITH 5000+5000 FOR SS="2"
*REPLACE ALL SUB_CL WITH EA6*(10000+8000)
*REPLACE ALL SUB_PU WITH ET*300
```

And to calculate the total amount of recurrent subsidy:

```
*REPLACE ALL TSUB WITH
 SUB_PU+SUB_CL+SUB_SCH+SUB_TEA
```

(5) It will soon be discovered that the average cost per pupil which is a very useful indicator has not been included in the data base. This additional requirement can be met by changing the structure of SCH1 by the MODIFY STRUCTURE command. The revised structure is shown below:

Figure VII: Revised Structure for SCH1

```
Structure for data base:    A:sch1:dbf
Number of data records:     45
Date of last update:        08/18/86
Field  Field Name   Type        Width      Dec
    1  ST           Character       2
    2  SS           Character       1
    3  SP           Character       2
    4  SKA          Character       2
    5  SKE          Character       2
    6  SE           Character       3
    7  SCH_CODE     Character      12
    8  NAME         Character      30
    9  ADDRESS      Character     100
   10  EA6          Numeric         4
   11  ET           Numeric         4
   12  SUB_PU       Numeric        10
   13  SUB_CL       Numeric        10
   14  SUB_SCH      Numeric        10
   15  SUB_TEA      Numeric        10
   16  TSUB         Numeric        10
   17  UCOST        Numeric         5
** Total **                      218
```

And the average cost per pupil can be computed by:

```
*REPLACE ALL UCOST WITH TSUB/ET.
```

(6) One way of monitoring the financial resources available to schools is to identify schools which have below-average level of finances. The procedure that may be adopted is:

*AVERAGE UCOST and the screen will show the results as follows:

```
   45 records averaged
ucost
 3186
```

To display those schools whose average subsidy per pupil is less than the average of 3186 Rp, the following command may be issued:

```
*DISPLAY SCH_CODE,NAME,UCOST FOR UCOST<3186
```

and the information displayed on the screen should look something like this:

| Record# | sch_code | name | ucost |
|---|---|---|---|
| 2 | 101230502002 | PEKAT | 2348 |
| 3 | 101230502003 | KWANGKO | 2990 |
| 5 | 101230502005 | SORIUTU | 2812 |
| 6 | 101230502006 | NO2 KEMPO | 2288 |
| 8 | 101230502008 | DOROPETI | 2344 |
| 9 | 101230502009 | NAPA | 2791 |
| 10 | 101230502009 | NAPA | 2484 |
| 12 | 101230502011 | KONTE | 2525 |
| 13 | 101230502012 | KESI | 1505 |
| 14 | 101230502013 | PUPAU BAJO | 2609 |
| 15 | 101230502014 | TANJU | 3132 |
| 16 | 101230502015 | TA'A | 2443 |
| 17 | 101230502016 | KADINDI | 1416 |
| 19 | 101230503001 | SDN NO.1 RANGGE | 2414 |
| 20 | 101230503002 | SDN DAHA | 2474 |
| 21 | 101230503004 | SDN SAWE | 2785 |
| 22 | 101230503005 | SDN JAMBU | 2074 |
| 23 | 101230503006 | SDN FANDA | 2518 |
| 26 | 102230503009 | SDN IMPRES SOKE | 2183 |
| 27 | 102230503010 | SDN IMPRES KUTA | 2551 |
| 30 | 102230503013 | SDN INPRES DESA HU'U | 2346 |
| 31 | 102230503014 | SDN INPRES JALA | 2594 |
| 35 | 101230504001 | SDN KILO | 2218 |
| 36 | 101230504002 | SDN LABI | 2069 |
| 38 | 101230504004 | SDN KIWU | 2235 |
| 39 | 101230504005 | SDN TAROPO | 2545 |
| 41 | 101230504006 | SD INPRES MALAJU | 2995 |
| 43 | 101230504009 | SD INPRES DESA MALAJU | 2617 |
| 44 | 101230504010 | SD INPRES PALI | 2863 |

Alternatively, one may wish to find out schools which are poorly financed. For example:

```
*DISPLAY SCH_CODE,NAME,UCOST FOR UCOST<2500
```

and the following schools will be listed:

| Record# | sch_code | name | ucost |
|---|---|---|---|
| 2 | 101230502002 | PEKAT | 2348 |
| 6 | 101230502006 | NO2 KEMPO | 2288 |
| 8 | 101230502008 | DOROPETI | 2344 |
| 10 | 101230502009 | NAPA | 2484 |
| 13 | 101230502012 | KESI | 1505 |
| 16 | 101230502015 | TA'A | 2443 |
| 17 | 101230502016 | KADINDI | 1416 |
| 19 | 101230503001 | SDN NO.1 RANGGE | 2414 |
| 20 | 101230503002 | SDN DAHA | 2474 |
| 22 | 101230503005 | SDN JAMBU | 2074 |
| 26 | 102230503009 | SDN IMPRES SOKE | 2183 |
| 30 | 102230503013 | SDN INPRES DESA HU'U | 2346 |
| 35 | 10[illegible]230504001 | SDN KILO | 2218 |
| 36 | 101230504002 | SDN LABI | 2069 |
| 38 | 101230504004 | SDN KIWU | 2235 |

(h) The Enrollment of Schools. It may be felt by some participants that the procedures outlined in the last two subsections are rather cumbersome, especially when two or more data bases have to be accessed at the same time. In this subsection, the utility program QUICKREPORT will be introduced. This program, like QUICKCODE III, is quite easy to use. The main features of this program are:

(1) It allows access to as many as 5 linked files at one time;

(2) It can easily cater for the use and display of computed fields;

(3) It permits subtotals and totals to be calculated and presented in report format for as many as 16 fields.

In short, QUICKREPORT represents an improvement over DBASE III automatic report generator. The purpose of introducing this software program here is more than serving the purposes of monitoring enrollment in schools. Participants who become familiar with this software can use it for a variety of reporting functions.

The software is not without limitation. At least for the purposes of this subsection, it is not flexible enough in selecting records to display. Data fields not included in the master data base cannot be used to extract records. This limitation excludes completely the use of computed fields, like that on the average class size in the school, for identifying schools which are to be shortlisted.

(i) What is presented below is an illustration of one application of QUICKREPORT. The exercise is to produce summary statistics based on information available in three data bases:

(1) SCHMAS - for providing information on the names of the schools;

(2) FLOW_RC - for providing information on the number of Primary 1 pupils admitted and the number planned to admit. This gives the percentage of P.1 places filled which can be used as an early indicator of the future utilization rate of the school concerned;

(3) PUPIL_RC - which will be used as the master data base in QUICKREPORT. The data base provides the basic information on the number of operating classes by grade, total enrollment, the school code, district, and subdistrict codes, and the code for type of school. The average class size can be computed from the total number of operating classes (a field yet to be created) and the total enrollment.

Using QUICKREPORT, a report file named ENR1.QR has been generated and stored in Diskette "EPP Mod.v.4." By running QUICKREPORT from either Drive C or Drive B, and placing the Diskette in Drive A, the report file can be executed to produce reports on the printer, the screen or to a disk file.

(j) The following attempt to depict the main procedural steps involved in creating the report file ENR1.QR.

(1) There are basically four steps involved in creating a report:

- selecting the master data file and its linked files;
- selecting the data fields to appear on the report from the files selected, including the creation of computed fields;
- the design of the report format using the "blackboard" provided by QUICKREPORT;
- the drawing up of the extraction criterion for selecting records to be extracted for display.

(2) Selection of the master data file and its linkup is extremely easy, as all one needs to do is to follow the instructions on the menu:

- after starting up QUICKREPORT, choose the report menu and choose create;

- then choose the data base menu to select the data base PUPIL_RC, and then the linked files FLOW_RC and SCHMAS. The selection can be performed by the so-called "list" technique which makes use of three function keys:

  [ F5 ] to enter the selection box
  [ RETURN ] to make the selection
  [ ESC ] to finish the process;

- the linkage between the three files is established through the control menu. Two instructions have to be given:
  the name of the index file
  the look-up field which links the files.
  It is therefore necessary to index the link file using the DBASE III commands, which have already been done in previous subsections;

- the control menu should look something like the following:

Figure VIII: QUICKREPORT Control Menu

```
REPORT DATA BASE FIELD   CONTROL PRINT OPTION LAYOUT EDIT SETUP
                         ┌──────────────────────────────────┐
                         │   MASTER FILE   PUPIL_RC.DBF     │
                         ├──────────────────────────────────┤
                         │LINK FILE     INDEX FILE  LOOKUP FIELD │
                         │SCHMAS.DBF    SCHMAS.NDX      SCH_CODE │
                         │FLOW_RC.DBF   FLOW_RC.NDX     SCH_CODE │
                         │                                       │
┌────────────────────────┴──────────────────────────────────────┐
│     MENU SELECTION│     SCH_CODE from PUPIL_RC.DBF  │         │
├──────────────────────────────────────────────────────────────┤
│@DATE     @PAGENUM      @TIME   C1     C2       C3     C4     │
│ C5       C6    CT      ET           SCH_CODE  SKA    SKE     │
│ SS                                                           │
└──────────────────────────────────────────────────────────────┘
Enter the fields used to connect Link files to the Master file
```

(3) The selection of fields in the three files for display follows similar techniques in selecting fields to become the look-up fields. The selection is performed under the data base menu. The following data fields have been selected:

| | | |
|---|---|---|
| From PUPIL_RC - | SKE | C4 |
| | SKA | C5 |
| | SS | C6 |
| | C1 | ET |
| | C2 | SCH_CODE |
| | C3 | |
| From SCHMAS - | NAME | |
| From FLOW_RC - | E1A | E1P |

(4) Three computed fields are required to be created:

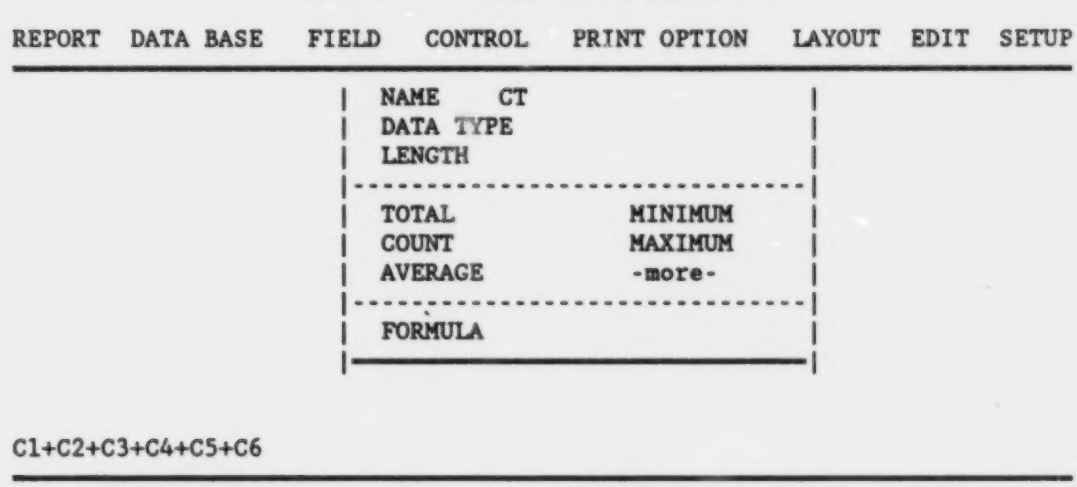
- One is to give the total number of operating classes which is equal to the sum of the values in fields C1,C2,C3,C4,C5 and C6. This field is named, for example, CT;

- One is to give the average class size which can be computed by dividing the total enrollment ET by the total number of operating classes CT. Let's call this field CSIZE;

- One is the percentage of Primary 1 places available which are taken up by Primary 1 pupils admitted. This can be computed by dividing E1A by E1P. Let's name this field as RATIO1.

The three computed fields may be created in the field menu. All one has to do is to name the computed fields and write the formula by simply typing operators (arithmetic and logical) and using the "list" techniques as demonstrated earlier on. The field menu should look like what is shown below:

Figure IX: QUICKREPORT Field Menu




It may be noted that the computed field CT is shown on the field menu and the formula "C1+C2+C3+C4+C5+C6" is given just above the menu selection.

(5) The design of the report format follows similar procedure as that used in DBASE III report generator. The key [F2] will shift the screen from the menu to the blackboard, and vice versa. There are five areas in the report format, each of which serves a different purpose:

- Report Header. This will be printed at the start of the report before any data bases are open. One cannot put any data base fields into this area.

- Page Header. This area is printed at the top of every page. It is most useful for the printing of titles, page numbers, field titles, etc.;

- Report Body. This is reserved for printing information for each record, and thus is the main part of a report. Fields, titles and other characters can be entered into this part;

- Page Footer. This is printed at the end of every page. It can be used to print page totals, page numbers or any other summary information;

- Report Footer. This is printed at the end of the report, after all the data bases are closed. It can be used to print the totals for the entire report, and any other information that one would like to appear at the end of the report.

The size of the five areas may be expanded or reduced by pressing respectively the "+" and "-" keys at the right of the numeric pad on the keyboard.

The following show the report design for the report file ENR1:

Figure X: Report Format Design for ENR1

---

Special Report on the Enrollment Position in Schools

| School Code | Name of School | Average Class Size | % of P.1 Places taken up |
|---|---|---|---|
| SCH_CODE | NAME | CSIZE | RATIO1 |

---

| DRAW REPORT | | PAGE FOOTER | | | |
|---|---|---|---|---|---|
| @DATE | @PAGENUM | @TIME | C1 | C2 | C3 | C4 |
| C5 | C6 | CSIZE CT | E1A | E1P | | ET |
| NAME | RATIO1 | SCH_CODE | SKA | SKE | | SS |

---

(6) The setting of the extraction criteria can easily be done in the control menu. The criteria are set up by assigning selection conditions to the values of the fields in the master data file so that any records satisfying these conditions would be extracted for display or printing. In this exercise, the selection criterion chosen is for schools located in the subdistrict "01." This condition may be changed every time the report is

displayed, so that in effect, one can select schools from a number of districts, one at a time. The following give the control menu for setting extraction criteria:

Figure XI: Control Menu for Setting Extraction Criteria

```
REPORT  DATA BASE   FIELD   CONTROL  PRINT OPTION  LAYOUT   EDIT  SETUP
```

```
                        | MASTER FILE   PUPIL_RC.DBF      |
                        |---------------------------------|
                        | SORT ORDER                      |
                        | BREAK GROUPS                    |
                        | LINK FILES                      |
                        | EXTRACT CRITERIA                |
                        |---------------------------------|
                        | MISSING LINK  SKIP  RECORD      |
                        | RESET PAGE NUMBERS     N        |
                        ===================================
```

```
SKE-"01"
```

```
          MENU SELECTION  |              RATIO1 from COMPUTATION
```

```
 @DATE       @PAGENUM     @TIME   C1     C2     C3     C4
   C5          C6         CSIZE   CT     E1A    E1P    ET
 NAME        RATIO1      SCH_CODE        SKA    SKE    SS
```

```
Enter formula.  Use F5 to insert a field at the cursor.
```

(7) The report design has to be saved before it can be run to print the report on the screen, the printer or to an external disk file. The following report should be produced if extraction condition is set to SKE-"04";

Figure XII: Sample Report from ENR1 File

Special Report on the Enrollment Situation in Schools

| School Code | Name of School | Average Class Size | % of P.1 Places taken up |
|---|---|---|---|
| 101230502001 | SDN NOI KEMPO | 21 | 40 |
| 101230502002 | PEKAT | 24 | 75 |
| 101230502003 | KWANGKO | 25 | 80 |
| 101230502004 | SORO | 9 | 20 |
| 101230502005 | SORIUTU | 28 | 121 |
| 101230502006 | NO2 KEMPO | 40 | 100 |

| | | | |
|---|---|---|---|
| 101230502007 | BANGGO | 13 | 40 |
| 101230502008 | DOROPETI | 27 | 15 |
| 101230502009 | NAPA | 22 | 100 |
| 101230502010 | NANGAMIRO | 14 | 40 |
| 101230502011 | KONTE | 26 | 32 |
| 101230502012 | KESI | 58 | 115 |
| 101230502013 | PUPAU BAJO | 38 | 100 |
| 101230502014 | TANJU | 20 | 62 |
| 101230502015 | TA'A | 35 | 925 |
| 101230502016 | KADINDI | 44 | 110 |
| 101230502017 | CALABAI | 31 | 60 |
| 101230502009 | NAPA | 23 | 100 |

Use F9 and F10 to scroll LEFT and RIGHT. Press RETURN for next screen.

5.2.3 Advisory Activities. In this subsection, we will experiment combining some of the techniques demonstrated in the previous subsections to perform the following functions:

(a) Simultaneously accessing data fields in three files (PUPIL_RC, FLOW_RC and TEA_RC). This is to be achieved using the JOIN command several times so that only one single file (which will be named SCH2) containing all the required data fields will be used;

(b) To compute a number of indicators using the REPLACE command and store these indicators in the new file SCH2. Additional fields have to be created to accommodate the indicators, using the MODIFY STRUCTURE facility in DBASE III;

(c) The records will be printed or displayed in a format to be created using the DBASE III report generator. Two new features will be added to the reports:

  (1) One is the SET RELATION command, which if used before the creation and printing of the report format, allows the report to access two data bases at the same time;

  (2) One is to use the FOR clause to set down extraction criteria in selectively displaying the records.

(d) The procedure that may be adopted is shown below:

  (1) In the first place, a new data base has to be created, containing fields which will store values for the following indicators:

    - the repetition rate;

- the proportion of P.6 leavers passing the final examination;
- the pupil-teacher ratio;
- the average class size;
- the proportion of unqualified teachers.

This new file is to be created using the PUPIL_RC data to start up. Two new commands are used in this exercise: COPY STRUCTURE and APPEND FROM.

*USE PUPIL_RC
*COPY STRUCTURE TO SCH2
*MODIFY STRUCTURE to delete fields which are no longer required, and to add the following new fields:

CSIZE - average class size
RRATE - repetition rate
PTRATIO - pupil/teacher ratio
NQRATE - % of unqualified teachers
P6RATE - % of P.6 pupils passing examination

*DISPLAY STRUCTURE, and the following should show up on the screen:

Figure XIII: Structure for SCH2

Structure for data base: A:sch2.dbf
Number of data records: 0
Date of last update: 08/18/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | SS | Character | 1 | |
| 2 | SKE | Character | 2 | |
| 3 | C1 | Numeric | 2 | |
| 4 | C2 | Numeric | 2 | |
| 5 | C3 | Numeric | 2 | |
| 6 | C4 | Numeric | 2 | |
| 7 | C5 | Numeric | 2 | |
| 8 | C6 | Numeric | 2 | |
| 9 | ET | Numeric | 4 | |
| 10 | SCH_CODE | Character | 12 | |
| 11 | CT | Numeric | 3 | |
| 12 | CSIZE | Numeric | 3 | 1 |
| 13 | RRATE | Numeric | 3 | 1 |
| 14 | PTRATIO | Numeric | 2 | |
| 15 | NQRATE | Numeric | 3 | 1 |
| 16 | P6PASS | Numeric | 3 | 1 |
| ** Total ** | | | 49 | |

*APPEND FROM PUPIL_RC and this will copy the data from PUPIL_RC. Data for fields not present in the SCH2 will not be appended.

*INDEX ON SCH_CODE TO SCH2 to create an index file called SCH2.

*DISPLAY STATUS will give the following:

```
Currently Selected Data base:
Select area: 1, Data base in Use: A:sch2.dbf Alias: SCH2
   Master index file:  A:sch2.ndx  Key: sch_code
```

(2) The next step is to create a new file by JOINING with the data base FLOW_RC and then TEA_RC.

```
*SELECT 2
*USE FLOW_RC INDEX FLOW_RC
*SELECT 1
*JOIN WITH FLOW_RC TO SCH3 FOR
 FLOW_RC->SCH_CODE=SCH_CODE
```

A new file SCH3 is created. By modifying its structure to delete fields that are not required one will get a data base SCH3 with the following structure:

Figure XIV: Structure for SCH3

```
Structure for data base:   A:sch3.dbf
Number of data records:    65
Date of last update:       08/18/86
Field  Field Name   Type         Width     Dec
    1  C1           Numeric          2
    2  C2           Numeric          2
    3  C3           Numeric          2
    4  C4           Numeric          2
    5  C5           Numeric          2
    6  C6           Numeric          2
    7  ET           Numeric          4
    8  SCH_CODE     Character       12
    9  CT           Numeric          3
   10  CSIZE        Numeric          3       1
   11  RRATE        Numeric          3       1
   12  PTRATIO      Numeric          2
   13  NQRATE       Numeric          3       1
   14  P6PASS       Numeric          3       1
   15  GL           Numeric          3
   16  GT           Numeric          3
   17  GP           Numeric          3
   18  RTT          Numeric          3
   ** Total **                      58
```

```
*SELECT 2
*USE TEA_RC INDEX TEA_RC
```

```
*SELECT 1
*JOIN WITH TEA_RC TO SCHSUM FOR
 TEA_RC->SCH_CODE=SCH_CODE
*USE SCHSUM
*DISPLAY STRUCTURE and the following will show up
 on the screen:
```

Figure XV: Structure for SCHSUM

Structure for data base: A:schsum.dbf
Number of data records: 65
Date of last update: 08/18/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | C1 | Numeric | 2 | |
| 2 | C2 | Numeric | 2 | |
| 3 | C3 | Numeric | 2 | |
| 4 | C4 | Numeric | 2 | |
| 5 | C5 | Numeric | 2 | |
| 6 | C6 | Numeric | 2 | |
| 7 | ET | Numeric | 4 | |
| 8 | SCH_CODE | Character | 12 | |
| 9 | CT | Numeric | 3 | |
| 10 | CSIZE | Numeric | 3 | 1 |
| 11 | RRATE | Numeric | 3 | 1 |
| 12 | PTRATIO | Numeric | 2 | |
| 13 | NQRATE | Numeric | 3 | 1 |
| 14 | P6PASS | Numeric | 3 | 1 |
| 15 | GL | Numeric | 3 | |
| 16 | GT | Numeric | 3 | |
| 17 | GP | Numeric | 3 | |
| 18 | RTT | Numeric | 3 | |
| 19 | YR | Numeric | 4 | |
| 20 | ST | Character | 2 | |
| 21 | SS | Character | 1 | |
| 22 | SP | Character | 2 | |
| 23 | SKA | Character | 2 | |
| 24 | SKE | Character | 2 | |
| 25 | SE | Character | 3 | |
| 26 | SESS | Character | 1 | |
| 27 | AP | Numeric | 2 | |
| 28 | LP | Numeric | 2 | |
| 29 | TP | Numeric | 3 | |
| 30 | AN | Numeric | 2 | |
| 31 | LN | Numeric | 2 | |
| 32 | TN | Numeric | 3 | |
| 33 | TM | Numeric | 3 | |
| 34 | TF | Numeric | 3 | |
| 35 | TT | Numeric | 3 | |
| 36 | NP1 | Numeric | 2 | |
| 37 | NP2 | Numeric | 2 | |
| 38 | NP3 | Numeric | 2 | |

| | | | |
|---|---|---|---|
| 39 | NP4 | Numeric | 2 |
| 40 | NP5 | Numeric | 2 |
| 41 | NP6 | Numeric | 2 |
| 42 | NP7 | Numeric | 2 |
| 43 | NP8 | Numeric | 2 |
| 44 | NPT | Numeric | 3 |
| 45 | PH | Numeric | 2 |
| 46 | PC | Numeric | 2 |
| 47 | PR | Numeric | 2 |
| 48 | PS | Numeric | 2 |
| 49 | PT | Numeric | 3 |
| 50 | NH | Numeric | 2 |
| 51 | NC | Numeric | 2 |
| 52 | NR | Numeric | 2 |
| 53 | NS | Numeric | 2 |
| 54 | NT | Numeric | 3 |
| 55 | NQT | Numeric | 3 |
| 56 | NHT | Numeric | 2 |
| 57 | NCT | Numeric | 2 |
| 58 | NRT | Numeric | 2 |
| 59 | NST | Numeric | 2 |
| 60 | GTT | Numeric | 3 |
| ** Total ** | | | 153 |

(3) The third step is to compute the value for the fields CT, CSIZE, RRATE, PTRATIO, NQRATE and P6PASS.

*REPLACE ALL CT WITH C1+C2+C3+C4+C5+C6 to give the total number of operating classes;

*REPLACE ALL CSIZE WITH ET/CT to give the average class size in each school, by dividing the total enrollment (ET) by the total number of operating classes (CT);

*REPLACE ALL RRATE WITH RTT/ET*100 to give the repetition rate, by dividing the total number of repeaters (RTT) by the total enrollment (ET);

*REPLACE ALL PTRATIO WITH ET/TT to give the pupil/teacher ratio, by dividing the total enrollment (ET) by the total number of teachers (TT);

*REPLACE ALL NQRATE WITH NQT/TT to give the proportion of unqualified teachers, by dividing the number of unqualified teachers (NQT) by the total number of teachers (TT);

*REPLACE ALL P6PASS WITH GP/GL*100 FOR GL>0 to give the percentage of P.6 pupils passing the final examination, by dividing the number of P.6 leavers passing the final examination (GP) by the total number of P.6 leavers (GL). The condition GL>0 is to safeguard against any schools with no P.6 leavers to avoid numeric overflow.

(4) The fourth step is to create a report format for displaying indicators constructed above together with the schools. The DBASE III report generator will be used. In this exercise, the file SCHMAS will also be used so that the report will show the names of schools selected as well. Accessing simultaneously two data bases requires the use of the SET RELATION command before the creation of the report file and the printing of the report. The following procedure may be adopted:

```
*SELECT 2
*USE SCHMAS INDEX SCHMAS
*SELECT 1
*INDEX ON SCH_CODE TO SCHSUM
*SET RELATION TO SCH_CODE INTO SCHMAS
*CREATE REPORT ENR2
```

Then the DBASE III full screen report generator will appear on the screen. By following the instructions given, one can create a report file ENR2. Very briefly, two steps need to be taken:

- In the option menu, one has to give the title of the report, as well as other page formatting instructions;

- In the column options, one has to select the names of the fields to be included in the report, and the headings of the fields which will appear on the report. One field will occupy one column, the width of which is determined the length of the column heading or the width of the field selected.

The report layout which appears in the report generator template will look something like the diagram below:

Figure XVI: Template for ENR2

```
 Options      Groups      Columns      Locate      Exit    09:42:44 pm

                                    |  SCH_CODE                        |
                                    |  schmas->name                    |
                                    |  CSIZE                           |
                                    |  RRATE                           |
                                    |  PTRATIO                         |
                                    |  NQRATE                          |
                                    |  P6PASS                          |

-----------------------------Report Format---------------------------------
 School Code    Name           Class  Rep.   P/T    % of      % of
                               Size   Rate   Ratio  Teacher   P.6
                                                    Not       Pupils
                                                    Qual.     Passing
---------------------------------------------------------------------------
XXXXXXXXXXXX   XXXXXXXXXXX    #.#    #.#    ##      #.#       #.#

---------------------------------------------------------------------------
CREATE REPORT     |<A:>|ENR2.FRM         |Opt.  1/7          |         |
    Position selection bar -.  Select - -+.  Leave menu -.
Step to any column immediately by selecting the column expression.
```

(5) The fifth step is to produce reports using the ENR2 file defined above on schools which require follow-up action, based on the barious indicators constructed above. One method of finding out the criteria of selection is to compute the mean values for the different indicators such as average class size.

*AVERAGE CSIZE,RRATE,PTRATIO,NQRATE,P6PASS and the following results should be shown on the screen:

```
      65 records averaged
  csize  rrate  ptratio  nqrate  p6pass
    28.6  18.2    26       0.2     68.7
```

Based on these mean values, a variety of reports may be produced.

```
*SELECT 1
*SET RELATION TO SCH_CODE INTO SCHMAS
*REPORT FORM ENR2 FOR CSIZE>28.6 .AND. RRATE>18.2
```

and this generates the following report:

Figure XVII: Sample Report 1 for ENR2

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Ad Hoc Report of Schools for the
Advisory Inspectorate

| School Code | Name | Class Size | Rep. Rate | P/T Ratio. | % of Teacher Not Qual. | % of P.6 Pupils Passing |
|---|---|---|---|---|---|---|
| 101230501003 | | 43.0 | 19.0 | 34 | 0.0 | 92.0 |
| 101230501004 | | 31.0 | 23.0 | 28 | 0.0 | 97.0 |
| 101230501006 | | 30.0 | 25.0 | 26 | 0.0 | 0.0 |
| 101230501007 | | 37.0 | 34.0 | 31 | 0.0 | 57.0 |
| 101230501010 | | 35.0 | 24.0 | 21 | 0.0 | 79.0 |
| 101230502006 | NO2 KEMPO | 40.0 | 22.0 | 27 | 0.0 | 97.0 |
| 101230502016 | KADINDI | 44.0 | 26.0 | 70 | 0.0 | 89.0 |
| 101230503004 | SDN SAWE | 34.0 | 22.0 | 20 | 0.0 | 100.0 |
| 101230503005 | SDN JAMBU | 39.0 | 20.0 | 34 | 0.0 | 71.0 |
| 101230503006 | SDN FANDA | 31.0 | 35.0 | 27 | 0.0 | 74.0 |
| 101230503007 | SDN NO.2 R | 30.0 | 23.0 | 16 | 0.0 | 70.0 |
| 101230504002 | SDN LABI | 33.0 | 50.0 | 38 | 0.0 | 89.0 |
| 101230504004 | SDN KIWU | 33.0 | 22.0 | 33 | 0.0 | 86.0 |
| 102230501032 | | 33.0 | 23.0 | 22 | 0.0 | 92.0 |
| 102230501034 | | 36.0 | 42.0 | 29 | 0.0 | 100.0 |
| 102230501037 | | 35.0 | 34.0 | 27 | 0.0 | 87.0 |
| 102230501039 | | 39.0 | 28.0 | 39 | 0.0 | 73.0 |
| 102230501041 | | 33.0 | 40.0 | 29 | 11.0 | 78.0 |
| 102230503013 | SDN INPRES | 29.0 | 35.0 | 22 | 0.0 | 67.0 |
| ** Total ** | | 665.0 | 547.0 | 573 | 11.0 | 1498.0 |

*REPORT FORM ENR2 FOR P6PASS<68.7 .AND. PTRATIO>26

and the following report will be produced:

Figure XVIII: Sample Report 2 for ENR2

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Ad Hoc Report of Schools for the
Advisory Inspectorate

| School Code | Name | Class Size | Rep. Rate | P/T Ratio | % of Teacher Not Qual. | % of P.6 Pupils Passing |
|---|---|---|---|---|---|---|
| 101230501003 | | 43.0 | 19.0 | 34 | 0.0 | 92.0 |
| 101230501004 | | 31.0 | 23.0 | 28 | 0.0 | 97.0 |
| 101230501008 | | 33.0 | 15.0 | 30 | 0.0 | 100.0 |
| 101230502002 | PEKAT | 24.0 | 9.0 | 48 | 0.0 | 89.0 |
| 101230502006 | NO2 KEMPO | 40.0 | 22.0 | 27 | 0.0 | 97.0 |
| 101230502008 | DOROPETI | 27.0 | 3.8 | 40 | 0.0 | 70.0 |
| 101230502009 | NAPA | 22.0 | 0.0 | 37 | 0.0 | 95.0 |
| 101230502009 | NAPA | 23.0 | 0.0 | 45 | 0.0 | 95.0 |
| 101230502011 | KONTE | 26.0 | 45.0 | 30 | 0.0 | 91.0 |
| 101230502012 | KESI | 58.0 | 4.6 | 49 | 0.0 | 86.0 |
| 101230502016 | KADINDI | 44.0 | 26.0 | 70 | 0.0 | 89.0 |
| 101230503005 | SDN JAMBU | 39.0 | 20.0 | 34 | 0.0 | 71.0 |
| 101230503006 | SDN FANDA | 31.0 | 35.0 | 27 | 0.0 | 74.0 |
| 101230504001 | SDN KILO | 42.0 | 7.2 | 30 | 0.0 | 78.0 |
| 101230504002 | SDN LABI | 33.0 | 50.0 | 38 | 0.0 | 89.0 |
| 101230504004 | SDN KIWU | 33.0 | 22.0 | 33 | 0.0 | 86.0 |
| 102230501033 | | 27.0 | 35.0 | 27 | 0.0 | 93.0 |
| 102230501034 | | 36.0 | 42.0 | 29 | 0.0 | 100.0 |
| 102230501037 | | 35.0 | 34.0 | 27 | 0.0 | 87.0 |
| 102230501039 | | 39.0 | 28.0 | 39 | 0.0 | 73.0 |
| 102230501041 | | 33.0 | 40.0 | 29 | 11.0 | 78.0 |
| 102230501042 | | 33.0 | 9.0 | 30 | 0.0 | 93.0 |
| *** Total *** | | 752.0 | 490.0 | 781 | 11.0 | 1923.0 |

```
*REPORT FORM ENR2 FOR PTRATIO>26 .AND. P6PASS<68.7
.AND. RRATE>18.2
```

This gives the third sample report as follows:

Figure XIX: Sample Report 3 on ENR2

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Ad Hoc Report of Schools for the
Advisory Inspectorate

| School Code | Name | Class Size | Rep. Rate | P/T Ratio | % of Teacher Not Qual. | % of P.6 Pupils Passing |
|---|---|---|---|---|---|---|
| 101230501007 | | 37.0 | 34.0 | 31 | 0.0 | 57.0 |
| 101230502004 | SORO | 8.7 | 28.0 | 29 | 0.0 | 0.0 |
| 101230504009 | SD INPRES | 28.0 | 23.0 | 28 | 0.0 | 7.4 |
| 101230504011 | SD KECIL E | 13.0 | 33.0 | 52 | 0.0 | 0.0 |
| *** Total *** | | 86.7 | 118.0 | 140 | 0.0 | 64.4 |

## 5.3 Monitoring of School Projects

5.3.1 The participants should have a firm grasp of the basic techniques in using DBASE III to construct and query a data base, and produce a variety of reports and compile statistical data from single or multiple data bases. Therefore, it is not proposed to repeat these demonstrations in this subsection. Furthermore, there are no data available to construct a data base of school projects. Nevertheless, in this subsection, the construction of a sample data base on school projects is demonstrated using QUICKCODE III. The purpose is to demonstrate how a simple information system on the progress of school projects could be set up, which will contain the various data items discussed in paragraph 4.2.6 above.

5.3.2 What is presented below is the procedure which may be followed in constructing the data base. If there are participants who have not gone through Module II and hence may not be familiar with the use of QUICKCODE III, the instructors will have to refer to the teaching materials in Module II on the use of this utility program. Very briefly, users have to perform three main functions in creating the data base file and other utility programmes:

(a) Designing the data input screen using the Quickscreen mode in QUICKCODE III, and at the same time drawing up the list of fields to be included in the data base, assigning them names as well as the primary field types

for the fields named. Three primary field types are allowed at this stage:

(1) Character type which will be automatically assigned if no other field type is named. The character type can be changed to data type or logical field using the Field Mode in QUICKCODE III;

(2) Integer type, which is defined by giving the character "#" at the end of the field name in Quickscreen;

(3) Money type, which is defined by giving the character "$" at the end of the field name in Quickscreen. The money type can be changed to numeric type (with 1 decimal place) using the Field Mode in QUICKCODE III.

The following diagram gives the screen design for the school project data base (PROJ.DBF) in Quickscreen mode:

Figure XX: Data Input Format for PROJ

```
LIN:  8   COL:  31          (AUTO PILOT)    SCR:  proj  DBF:  proj
-------------------------------------------------------------------------
                School Project Quarterly Progress Report
=========================================================================
Budget Ref.   ;br    Project Ref.    ;pr        Project Number    ;pnr
Province      ;sp    District        ;ska       Subdistrict       ;ske
-------------------------------------------------------------------------
Date of Commencement  ;start     Planned complete date          ;end
Number of classrooms  ;class#    Project officer/agency         ;agent
Project budget        ;budget$
=========================================================================
Current Project Status
-------------------------------------------------------------------------
Stage of progress  (enter code)     ;prog                      ;ref
-------------------------------------------------------------------------
Amount of money committed           ;com$
Amount of money spent to date       ;spent$                ;unspent$

Additional amount required          ;add$                  ;rbudget$

-------------------------------------------------------------------------
Revised date of completion          ;newend

-------------------------------------------------------------------------
```

It may be noted from the above screen design that there are three computed fields:

REF which will be used as the unique identifier for the project concerned and is formed by concatenating the fields on budget reference BR, project reference PR, project number PNR, province SP, district SKA, and subdistrict SKE;

UNSPENT which gives the amount of budget not yet spent and is derived from the difference between the amount budgeted BUDGET and the amount already spent SPENT;

RBUDGET which is the revised budget for the project if there is any additional financial information required. This is derived from adding the amount budgeted BUDGET to the additional financial provision required ADD.

(b) The characteristics for the various fields defined above in Quickscreen will have to be determined in the Field Mode. The computation required for the computed field will also have to be set in the Field Mode. The results are shown below:

Figure XXI: Field Mode for PROJ

| # | FIELDNAME | T | LEN | F | DEFAULT | MIN. | MAX. | ERROR MESSAGE | VAL | ER |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | *NONE* | *NONE* | *NONE* | *NONE* | * | 3 |
| 1 | br | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 2 | pr | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 3 | pnr | C | 3 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 4 | sp | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 5 | ska | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 6 | ske | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 7 | start | D | 8 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 8 | end | D | 8 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 9 | class | I | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 10 | agent | C | 11 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 11 | budget | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 12 | prog | C | 2 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 13 | ref | C | 13 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 14 | com | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 15 | spent | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 16 | unspent | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 17 | add | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 18 | rbudget | $ | 10 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |
| 19 | newend | D | 8 | F | *NONE* | *NONE* | *NONE* | *NONE* | * | 0 |

It may be noted that the field type for the fields START, END and NEWEND have been changed from character to data type. The next step is then to define the computed fields and to tell the system.which fields will

be shown or not given in the data input screen. The results are given in the diagram below:

Figure XXII: Field Mode for Computed Fields

| # | FIELDNAME | T | LEN | F | SHOW | COMPUTATION | ER |
|---|---|---|---|---|---|---|---|
| 0 | MQ_MODE | C | 7 | | YES | *NONE* | 3 |
| 1 | br | C | 2 | F | YES | *NONE* | 0 |
| 2 | pr | C | 2 | F | YES | *NONE* | 0 |
| 3 | pnr | C | 3 | F | YES | *NONE* | 0 |
| 4 | sp | C | 2 | F | YES | *NONE* | 0 |
| 5 | ska | C | 2 | F | YES | *NONE* | 0 |
| 6 | ske | C | 2 | F | YES | *NONE* | 0 |
| 7 | start | D | 8 | F | YES | *NONE* | 0 |
| 8 | end | D | 8 | F | YES | *NONE* | 0 |
| 9 | class | I | 2 | F | YES | *NONE* | 0 |
| 10 | agent | C | 11 | F | YES | *NONE* | 0 |
| 11 | budget | $ | 10 | F | YES | *NONE* | 0 |
| 12 | prog | C | 2 | F | YES | *NONE* | 0 |
| 13 | ref | C | 13 | F | NO | br+pr+pnr+sp+ska+ske | 0 |
| 14 | com | $ | 10 | F | YES | *NONE* | 0 |
| 15 | spent | $ | 10 | F | YES | *NONE* | 0 |
| 16 | unspent | $ | 10 | F | NO | budget-spent | 0 |
| 17 | add | $ | 10 | F | YES | *NONE* | 0 |
| 18 | rbudget | $ | 10 | F | NO | budget+add | 0 |
| 19 | newend | D | 8 | F | YES | *NONE* | 0 |

(c) Finally, after all the data fields have been defined in the Field Mode, one can go back to the QUICKCODE III main menu by pressing CONTRL B to revert back to the Quickscreen and then [F1] to go back to the main menu. By pressing ESC, all the required programs may be generated by the QUICKCODE III system. A total of 11 programs have been generated and are stored in the Diskette "EPP Mod.v.4." To run these programs, one has to start up DBASE III from either Drive B or Drive C, and put the Diskette in Drive A. After starting up DBASE III,

```
*SET DEFAULT TO A
*DO PROJ
```

and an opening menu will appear, from which a number of functions such as adding records to the data base, editing records, etc., may be selected.

6. Learning Activities

6.1 What has been covered in the User Manual Section are the main techniques used in extracting and manipulation of data stored in a single or multiple data base(s). It is essential therefore that the participants devote ample time to practicing these techniques, using other combinations of commands and conditions not yet demonstrated in the User Manual Section. Most of these techniques should be adequate for users in performing ad hoc inquiries on the data bases. For those who want to pursue further DBASE III programming techniques, and those who have the need for a more efficient system of querying the data bases, they may attempt to combine the sequence of commands used at the dot prompt level into simple batch-type programmes. This will lead to a more efficient and automatic data processing system, so that more time-consuming procedures could be run unattended, and the applications could be handled by less knowledgeable users.

6.2 The learners are advised to spend more time in going through the User Manual together with the instructors. The methods of calculations are bound to be different from what are currently practised by the learners. Therefore, there should be ample opportunities for the learners to suggest alternative methods for calculating teacher entitlements in schools or for estimating the amount of subsidy required by schools. These alternatives should be studied and the learners should, following the procedures demonstrated in the User Manual Section, attempt to design the DBASE III command procedures to cater for the different methods of calculations.

## III. Unit 2

## Monitoring Performance of Education System

7. Performance Objectives

7.1 A variety of statistical information could be compiled from the education management information system outlined in Module II for the purposes of managing the education sector as a whole. They are quite similar to those discussed in Unit I above, except that the unit of analysis is the education system as a whole, rather than individual schools or other educational institutions, or individual programmes. It is not proposed to cover the entire spectrum of management statistics, which could embrace information on finances, information on teachers and other personnel, information on institutions including schools, research agencies, examination authorities, etc., and information on pupils. The .

focus of this unit is on the construction and use of educational indicators for monitoring the performance of the education system.

7.2 On completion of this unit, the participants should be able to:

(a) Design indicators to monitor the performance of the education system;

(b) Make use of the education management information system and the data base software package DBASE III in constructing the indicators for the country as a whole, or a given province or district, or for a given type of school.

## 8. Instructional Activities

### 8.1 Uses and Limitations of Indicators

8.1.1 The main concern of planners and administrators are, at the risk of oversimplification, is to find out the following:

(a) Whether educational programmes are implemented according to plan, with the expected effectiveness;

(b) The problems encountered;

(c) The causes of the problems;

(d) The alternatives available to solve the problems and the methods and criteria that can be adopted to assess the effectiveness, costs and other implications of these alternatives, and to choose from among the alternatives available the best one for implementation.

The purpose of management statistics is to provide the necessary information which could throw light on the above. Indicators are one kind of management information which could provide planners, administrators and policymakers quickly with up-to-date summary information on the above. Based on the information, users can quickly appraise the situation, take correct measures accordingly or commission a more detailed study or research on the matter. For indicators which are compiled on a consistent basis over time, they can provide extremely useful indication of any changes over time, which could be difficult to identify from the massive amount of statistics available. These statistics are usually collected and analyzed in a disaggregated and sometimes decentralized manner. One example of the aggregated nature of indicators is public expenditure on education as a percentage of the gross national (or domestic) product which

gives a summary indication of the resources devoted to education. There are studies which make use of indicators for exploratory research on causal effect of education on economic development. A classic example is the Harbison and Myers study on the correlation between human resources and economic growth.

8.1.2 Indicators cannot possibly be used to summarize all management statistics which are available. One would not have a very thorough understanding of the phenomenon which a given education indicator purports to highlight without going into details of the statistics available. An example is the illiteracy rate. The rate gives a summary information on the size of the problem of illiteracy. But unless detailed statistics are available on the geographical distribution of illiterate populations, their age and sex distribution, etc., it is difficult to design and mount any programme to combat illiteracy, nor to assess the effectiveness of a given nonformal education programme. Therefore, indicators cannot replace the bulk of statistics that should be collated and presented to users as well.

## 8.2 Criteria in Monitoring Performance

8.2.1 Before one can proceed to construct a set of educational indicators to monitor the performance of the education system, the question that would naturally rise is on what basis should performance be monitored. This is a more difficult question to answer than the problem of constructing a set valid and appropriate educational indicator. Education has been conceived by many as the key factor contributing to economic growth, in maintaining national unity, in preserving the culture of a society, in redressing social injustice, and even combating crime, etc. For different people like the students, the parents, the government, and voluntary agencies like the religious bodies, they have different motives in providing education or for becoming educated. It is thus extremely difficult to lay down a set of criteria agreeable to all for assessing the performance of an education system.

8.2.2 It is not proposed to indulge in this sort of argument in this Module, as it is clearly not the purpose. What appears to be less controversial norms for planning education and monitoring its performance are two rather simple concepts:

(a) Equity;
(b) Efficiency.

However simple these concepts are, there are nonetheless a dozen different interpretations of what equity means in

practice. The argument on whether it is equity in terms of treatment or in terms of achievement is still an unsettled debate, although some have already conceded that equity cannot be achieved but approached. Efficiency could be looked at from the point of view of the internal efficiency of the education system and from the point of view of its external efficiency. The problems here are not so much with the question of interpretation, but rather are related to the difficulties in measuring efficiency.

8.2.3 Notwithstanding these conceptual problems, planners and administrators have to rely on indicators of some sort to help them perform their duties. Most of the indicators commonly in use evolve around the concepts of equity and efficiency which seems to become the basic principles in planning and implementing education policies:

(a) Indicators of equity include such estimates as the proportion of children not attending schools, disaggregated into different regions, ethnic groups or socioeconomic classes;

(b) Indicators of internal efficiency include the repetition and dropout rates, the number of pupil-years required to produce a graduate, etc.;

(c) Indicators of external efficiency include the famous internal rate of return to education, the proportion of graduates gainfully employed, etc.

## 8.3 Techniques in Constructing Indicators

8.3.1 There are three main approaches to the construction of educational indicators:

(a) The first one is the use of simple indices which is calculated by:

(1) taking the arithmetic mean or median for the relevant statistics or statistical distribution. One example is the mean pupil/teacher ratio or the average class size in all primary schools. If the distribution is affected by the presence of extreme values, the median would be used. An example is the median income of school leavers:

(2) taking the percentage of "population" possessing the given characteristics. Examples of this type of indicator includes percentage of population who are illiterate, the percentage of school-age population attending schools, etc.;

(3) taking the rate of change over time. This includes, for instance, the rate of increase in enrollment.

(b) The second approach is the construction of the so-called synthetic indicators. This involves more complicated procedures in aggregating a number of subsidiary indices, suitably weighted. The composite index of human resources development constructed by Harbison and Myers is one example. Another method is to construct the index based on a set of behavioral assumption. An example is the various indicators such as the input/output ratio compiled from the reconstructed cohort method which would be discussed in Module IV.

(c) The third approach is the estimation of life expectancies. The technique makes use of the life table approach to estimate the number of years children would spend in full-time education. Like the demographic measure of life expectancies, this sort of indicator provides useful summary information of the availability of education to children at a given point in time.

Not all the approaches discussed above will be covered in this Module. Examples in respect of (a) above will be cited. For (b), an illustration of the use of the reconstructed cohort method will be given in Module IV.

8.3.2 Finally, users of educational indicators should not be deceived by the sophistication and complication in the techniques used to construct indicators. Not all indicators are <u>direct</u> measures of the state of affair of which users wish to examine. Direct measures include most of the quantitative indicators indicators on the percentage of school-age population enrolled in schools. Many indicators which purport to measure the quality of education are, however, simply <u>proxy</u> indicators which are only valid if the assumption regarding the high correlation between the proxy indicators and the subject matter is valid. A notable example is the average class size which is supposedly a measure of the quality of education. However, numerous studies have confirmed that the quality of teaching is not necessarily correlated with a smaller class size. Smaller class size may permit the use of a more pupil oriented teaching method which is more conducive to the learning process. Thus reducing class size per se will not automatically bring about an improvement in the quality of education.

## 8.4 Types of Indicators

8.4.1 In the User Manual Section to follow, an attempt is made to construct a number of educational indicators from the education management information system set up in Module II. It is stressed that this list is by no means exhaustive. Users should bear in mind the limitations and other considerations which have been discussed in the earlier part of this Unit. From the list of indicators, one could distinguish between:

(a) an indicator which measures input into the education system, and

(b) one which measures the output.

For some time, planners and statisticians have tried to measure, apart from input and output, the process of the education system. This means the construction of indicators which can throw light on what is happening in the classroom. It appears nothing useful has come up so far. As a result, one has to rely on measures of either input or output, or measures which compare input with output, to gauge which is happening to the educational process.

# 9. User Manual

## 9.1 Getting Started

9.1.1 This user manual is designed for:

(a) The instructors in demonstrating how to compile educational indicators from the education management information system, using DBASE III, for a given province, district, or subdistrict;

(b) The learners in practising the procedures suggested for the construction of such indicators.

9.1.2 The participants should have by now gone through most of the command level functions in DBASE III for information process and retrieval. Most of the techniques applicable to the retrieval of information classified at the school level will also apply to the retrieval of information at the province, district, or subdistrict level. The additional feature in DBASE III which will be discussed is the use of the MODIFY REPORT command and the SUMMARY command, the latter of which has already been discussed in Module II.

9.1.3 The data files required for the practical exercises are stored in the Diskette "EPP Mod.v.3." The database ENR2 which combines information from the PUPIL_RC, FLOW_RC, and TEA_RC data bases, will be used in the exercises. However, in order to avoid changing the data base ENR2 which is required for Unit 1, a copy of the file, renamed as ENR3 has been prepared for this Unit.

9.1.4 It is recommended to start up DBASE III from either Drive C or Drive B, and put the Diskette "EPP Mod.v.3" in Drive A. After starting up the DBASE III system, type *SET DEFAULT TO A at the dot prompt.

## 9.2 Compiling Indicators

9.2.1 Three steps have to be taken in compiling indicators from the education management information system for different provinces, districts, or subdistricts:

(a) Creating a summary file which contains the summary information of all schools grouped into sub-districts. This is achieved through the TOTAL command which has already been discussed in Module II. The procedure which may be adopted are as follows:

(1) *USE SCHSUM
*COPY TO SCHSUM1 to create a dummy datafile from which a summary file for subdistrict totals will be created;
*USE TO SCHSUM1;
*MODIFY STRUCTURE to increase the length of the numeric fields in order to avoid numeric overflow when the TOTAL command is executed;
*DISPLAY STRUCTURE will give the following:

Figure XXIII: Structure for SCHSUM1

Structure for data base: A:schsum1.dbf
Number of data records: 65
Date of last update: 08/22/86

| Field | Field Name | Type | Width | Dec |
|---|---|---|---|---|
| 1 | ET | Numeric | 6 | |
| 2 | SCH_CODE | Character | 12 | |
| 3 | CT | Numeric | 5 | |
| 4 | CSIZE | Numeric | 5 | |
| 5 | RRATE | Numeric | 6 | 1 |
| 6 | PTRATIO | Numeric | 5 | |
| 7 | NQRATE | Numeric | 7 | 1 |
| 8 | P6PASS | Numeric | 7 | 1 |
| 9 | GL | Numeric | 5 | |

| | | | |
|---|---|---|---|
| 10 | GT | Numeric | 5 |
| 11 | GP | Numeric | 5 |
| 12 | RTT | Numeric | 5 |
| 13 | YR | Character | 4 |
| 14 | SS | Character | 1 |
| 15 | SKE | Character | 2 |
| 16 | SE | Character | 3 |
| 17 | SESS | Character | 1 |
| 18 | NQT | Numeric | 5 |
| 19 | GTT | Numeric | 5 |
| ** Total ** | | | 95 |

It may be noted that some of the redundant fields have been deleted from the data base.

(2) The next is to create the summary file from SCHSUM1.
*INDEX ON SKE TO SSUMSKE to index the data file SCHSUM to the field which will be used to group schools with the same field value to form a single record in the summary file.

*TOTAL ON SKE TO SSUM
*USE SSUM
*REPLACE ALL CSIZE WITH ET/CT to compute the average class size for each subdistrict;

*REPLACE ALL RRATE WITH RTT/ET*100 to calculate the rate of repetition;

*REPLACE ALL PTRATIO WITH ET/GTT to give the pupil/teacher ratio;

*REPLACE ALL NQRATE WITH NQT/GTT*100 to give the percentage of teachers not qualified;

*REPLACE ALL P6PASS WITH GP/GL*100 FOR GL>0 to compute the percentage of P.6 leavers passing the final examination.

(3) Finally, one can retrieve information from the summary file, using dot prompt commands like BROWSE, DISPLAY. Alternatively, one can design a report format to present data. The following shows the latter approach by modifying the report file ENR3 which has been created by copying from the file ENR2 created in the previous Unit.

*MODIFY REPORT ENR3, and after following the instructions given on screen, one may arrive at a modified report format as per Figure XXIV below:

Figure XXIV: Screen Design for ENR3

```
Options     Groups     Columns     Locate     Exit     09:50:40 am
```

| | |
|---|---|
| Contents | PTRATIO |
| Heading | Pupil/;Teacher;Ratio |
| Width | 7 |
| Decimal place | 0 |
| Total this column | No |

```
--------------Report Format-----------------------------------------
|                                                                   |
|Subdistrict   Total   Ave. Repet.  Pupil/  % of Teachers  % of P.6|
|   Code       Enrol.  Class Rate   Teacher    not          pupils  |
|                      Size         Ratio     qualified    passing |
|-------------------------------------------------------------------

|     XX      #######  ###.#  ####.#  #####    #####.#      #####.# |
-------------------------------------------------------------------

MODIFY REPORT     |<A:>ENR3.FRM        |Column: 5
Position selection bar -.  Select - -+.  Prev/Next column -
                                                    PgUp/PgDn.
Enter a field or expression to display in the indicated report column.
```

To display the report using the report format ENR3, the following command may be used:

*REPORT FORM ENR3, and the following will show up on the screen:

Figure XXV: Report of SSUM Using ENR3 Format

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Selected Educational Indicators

| Sub-district Code | Total Enrol. | Average Class Size | Repetition Rate | Pupil/ Teacher Ratio | % of Teachers Not Qualified | % of P.6 pupils passing |
|---|---|---|---|---|---|---|
| ** School Status Code 1 | | | | | | |
| 01 | 4578 | 32.0 | 23.4 | 25 | 48.1 | 88.8 |
| 02 | 3126 | 26.0 | 16.9 | 29 | 0.0 | 88.1 |
| 03 | 2518 | 29.0 | 16.9 | 19 | 0.0 | 79.7 |
| 04 | 1563 | 26.0 | 19.3 | 24 | 0.0 | 74.1 |

Following similar procedures, different reports may be generated, using DBASE III, from the education management information system.

10. Learning Activities

10.1 Microcomputer Tutorial Session. This Unit is rather short because more of the DBASE III commands have already been introduced in Unit 1 or in Module II. The participants are only required to practice modifying the previously designed report format to compile the various summary indicators for different districts. The learners would appreciate that to master the techniques of retrieving information from the data base should not be too difficult, although DBASE III language is not at all easy to learn. What is proposed for the practical session in this Unit is for the learners to go through the various steps demonstrated in this Unit.

11. Post-assessment

11.1 The learners are required to experiment compiling the following indicators from the original PUPIL_RC, FLOW_RC and TEA_RC, using the JOIN, REPLACE, TOTAL commands:

(a) The proportion of female teachers;

(b) The proportion of female pupils;

(c) The proportion of pupils who are overaged (i.e., over the age of 13 years);

(d) The teacher/class ratio;

(e) The average number of pupils per school.

EPP

# EDUCATIONAL POLICY AND PLANNING PROJECT

A GOVERNMENT OF INDONESIA - USAID PROJECT

# INDONESIA

## Microcomputer Applications for Education Planning and Management: A Modular Training Program

**MODULE IV**

**Use of the Management Information System for Education Planning**


Pusat Informatika
Balitbang Dikbud

DEPARTMEN PENDIDIKAN
DAN KEBUDAYAAN

Center for Informatics
Office of Educational and Cultural Research and Development

MINISTRY OF EDUCATION
AND CULTURE

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## PREFACE

The Educational Policy and Planning (EPP) Project is a seven year project conducted jointly by the Indonesia Ministry of Education (MOEC) and the United States Agency for International Development (USAID). The overall project objective is to improve the quality of education in Indonesia by assisting the MOEC, through the Office of Educational and Cultural Research and Development (Balitbang Dikbud), to formulate better policies and long-term plans. The project aims to improve policy formulation and long-term planning by improving the timeliness, relevance and accuracy of educational data collection, the subsequent analyses of such data, and their ultimate use for policy and decisionmaking.

There are three major components of the EPP Project: (1) development of an integrated management informations system (MIS) within the MOEC, (2) enhancement of MOEC policy research and analysis capacity, and (3) support for MOEC institutional development at the national and provincial level through training and technical assistance. EPP technical advisory staff work closely with counterpart Indonesian staff as part of a collaborative process of developing institutional capacity.

Dr. Boediono
Head, Center for Informatics
Office of Educational and Cultural Research and Development
Department of Education and Culture
Republic of Indonesia

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The EPP Project in collaboration with the USAID Improving the Efficiency of Educational Systems (IEES) Project, publishes EPP documents in order to disseminate this knowledge and extend its usefulness. EPP has carried out a series of policy studies designed to provide answers to key questions facing Indonesian educators. These include:

The Quality of Basic Education
The Quality and Efficiency of Vocational/Technical Education
The Strengthening of Local Education Capacity
Developing Indicators of Educational Efficiency
Teacher Education Issues
Curriculum Reform and Textbook Production
Education, Economic, and Social Development

This series has been planned under the direction of Moegiadi, Balitbang Dikbud, and Boediono, Center for Informatics, Balitbang Dikbud and Simon Ju, EPP Chief of Party.

Editors for the series are Abas Gozali, Reta Hendrati Dewi, Center for Informatics, and Jerry Messec, IEES, Florida State University.

# INTRODUCTION TO EPP TRAINING MODULES ON THE DEVELOPMENT & USE OF MIS ON MICROCOMPUTERS

## 1.0 Purposes

1.1 These training modules on the development and use of the education management information system are primarily designed for planners and administrators at the provincial level, who are responsible for collecting, processing and analyzing statistics for educational planning and management. The main feature of the modules is the use of microcomputers to enhance the speed, flexibility, and versatility in the use of information.

1.2 The purposes of the modules are as follows:

- To introduce to the participants the basic framework of an integrated education management information system which could be used to serve the varied needs of different users;
- To demonstrate how such a system could be set up, making use of microcomputers, and how data could be retrieved for analytical purposes;
- To show how an interactive model(s) for diagnostic, forecasting, planning and budgeting purposes could be developed on microcomputers; and
- To show, as well, how the computer system and the models could easily be modified to cope with unforeseen changes in requirements, with the help of user-friendly software packages abundantly available on the market.

## 2.0 The Hierarchies of Information

2.1 When viewed in terms of the point at which information is collated and used, there are three main levels of information:

- The school level, at which detailed information about individual pupils, teachers and staff (including their name, age, sex, grade, home address, academic performance, qualification, salaries, etc.), as well as information about the schools (e.g., area, number of rooms, equipment, etc.) have to be kept for the smooth running of the schools concerned;
- The district level, where not all the data kept by schools are required. Only summary statistics such as the number of pupils by age, sex and grade, and the amount of recurrent expenditures are required for individual schools; and
- The national level, where, depending on the extent of decentralization, detailed information on individual schools may not be required. Only summary information is collected at the subdistrict or district level.

2.2 Alternatively, depending on the usage, information could be distinguished between that for:

- planning,
- management control, and
- operation.

2.3 Ideally, information at the school, district, and national level should be integrated and shared in one, or one network, of data base(s). For instance, information stored in schools could be computerized, and only the relevant data would be extracted and passed to the computer system kept at the district level;

and the similar procedure could apply to the flow of information between the district and national level. This could help avoid a lot of duplication of work, and solve the problems of quality of data and the time lag in producing the information. With the use of individualized data bases, more accurate information could be made available about pupil and teacher flow, which is extremely useful in planning school location, and teacher demand and supply. The individualized data base could also reduce considerably the data problems confronting educational researchers, especially those engaged in longitudinal studies.

2.4 Similarly, the same can be said of information for planning, management control and operation. For instance, a simple ledger accounting system, if carefully designed and computerized, could provide a wealth of information useful in monitoring spending, analyzing cost structure and efficiency, as well as for forecasting and planning educational expenditures.

2.5 For the purpose of the present training modules, it is not proposed to cover the entire spectrum of the information system as discussed above, which would be clearly beyond the scope of this training program. Attention will mainly be focused on the following:

- The flow of information from schools to the provincial and central offices via the usual channel of school surveys conducted by the Balitbang; and
- The use of such information for planning and administrative purposes at the central as well as provincial level.

Once the participants have mastered the basic principles and techniques discussed in this training program, they should have relatively little difficulties to applying them to different information environments in their daily work.

## 3.0 Organization of the Modules

3.1 There will be four modules in this training program, which are as follows:

- Module I: Overview of basic concepts and computer applications in educational planning, management, and research;
- Module II: The development of the Education Management Information System;
- Module III: The use of the Education Management Information System for management control; and
- Module IV: The use of the Education Management Information System for planning.

## 4.0 The Structure of Instructional/Learning Process

4.1 Much of the emphasis placed in this training program is the use of microcomputers and software packages. Although data base and spreadsheet programs for data files creation and manipulation and modeling have already been designed for the participants, they inevitably have to understand and practice the techniques in the use of microcomputers and software packages. With the availability of many user-friendly software packages and utility programs, computer programming could be kept to a minimum. It is also the aim of this training module to show to the participants that understanding the basic principles and operating system of the various software packages would be sufficient to enable them make full use of the information available to them for planning, management and research. For those participants who have a keen interest in computer programming and in mastering the software package, this training module will prepare them for further improving their computer skills by practicing the techniques demonstrated in this program.

4.2 It is recognized that the design of a management information system should be largely user oriented. It should start by looking at the potential uses of information rather than for the collection of information per se. However, it would be deceptive to assume that all potential uses of information could be foreseen at the time a management information system is constructed. Furthermore, the requirements and practices in educational planning and management in Indonesia vary considerably from province to province. Thus, it is almost impracticable to include the specific requirements of each and every province in designing the training modules.

4.3 Naturally, participants to the training program would come from different divisions of the provincial education offices. Some of them may mainly be concerned with say planning and budgeting, while others in the supervision of schools or other management functions. Some may be involved only in data collection. Consequently, not all parts of the training program would be of equal interest to the participants.

4.4 Taking into account the above considerations, the approach adopted in the design of the training materials is as follows:

- APPLICABILITY is emphasized in the training program. Wherever possible, practical sessions on microcomputer applications are included in the modules so that the participants can have "hands-on" experience in the course. They will also be invited to try to include some of their daily planning, management and research tasks into the practical sessions, making use of some of the techniques and methods discussed in the training program;

- FLEXIBILITY will be introduced in the design of the training materials so that alternate designs and applications of the management information system will be tested during the practical sessions, making full use of the versatility and flexibility of a computerized data base and the computer software packages; and

- a MODULAR approach will be adopted in the course so that each module is as self-contained as possible.

4.5 The structure of the instructional and learning activities for each of the four modules will thus be arranged as follows:

- Overall Objectives of each of the modules will first be stated so that instructors are aware of the while purpose of the module as well as the knowledge which is expected to be imparted during the instructional and learning processes;

- Module Performance Objectives will also be stated to enable the instructors to assess the extent to which the behavior of learners would be changed upon completion of the module. More specific performance objectives will also be given for different instructional units within a module;

- The actual instructional and learning processes are divided into four phases as follows:

  - Instructional activities where the instructors will present to the learners the teaching materials for the module and unit concerned. The teaching materials will cover the basic conceptual issues related to the topic in question, and fundamentals of computer applications that will be demonstrated, highlighting strengths and weaknesses of such applications;

  - User manual where the instructors will carry on with the presentation, but using microcomputers to demonstrate the various applications in planning, management, and research. The detailed step-by-step procedures required to be followed in developing and using the different computer applications will be described in this user manual section. Therefore, this section is designed for both the instructors and the learners;

- Learning activities where the interaction between the instructors and learners will take place. The learners will be asked to:

  - practice the techniques in developing and using the data bases or models demonstrated by the instructors;

  - then the participants will be divided into groups to discuss the concepts, approaches and methods used in the training materials. During the group discussion, they will be asked to suggest alternative approaches to the development and use of the management information system;

  - based on the alternative designs suggested, the learners will, under the guidance of the instructors, actually develop a new management information system and different models of computer applications;

- Post-assessment where the instructors will attempt to evaluate the extent to which the learners have been able to have a firm grasp of the contents of the training materials. A number of questions and assessments have been proposed in the unit, and individual learners will be asked to do the assignments themselves.

## 5.0 Choice of Computer Software Packages

5.1 With the rapid development in computer technology, it is difficult to choose software packages which are both the most up- to-date and are familiar to both instructors and learners. Therefore, the factors used in choosing a computer software are the power of the software, the ease of use and its popularity.

5.2 Two types of computing functions are required for these training modules:

- data base management; and
- spreadsheet applications.

A number of software packages have been very successful in integrating data base management with spreadsheet applications, and some statistical functions. However, these packages have limitations which dictate against using them in the training program. Nearly all of these packages are memory (or RAM) based, thus severely limiting the size of the data base that could be handled by the package. The availability of RAM banks or boards can increase the memory capacity of a 16-bit computer like an IBM PC/XT or its compatible to something like 8 mega-bytes. However, these are not yet very popularly used. Furthermore, most of these integrated softwares are not designed to handle relational data bases, a feature which is required in developing the management information system proposed in this training program. As a result, two separate software packages have been used in this training program, with each performing one of the two functions mentioned above.

5.3 A large number of data base and spreadsheet packages are available. The choice of one set of packages does not imply that the others available in the market are not suitable. The following packages are chosen for reasons given below:

- DBASE III (version 1.1 or 2) has been chosen for data base management. There are other data base packages which are as powerful as DBASE III, like RBASE 5000 and KNOWLEDGE 2. DBASE III is chosen mainly because it is more user-friendly with its assistant facilities. Other equally if not more powerful softwares like REVELATION and INFORMIX could be adopted in the training program. But it appears DBASE III is more popularly used in IBM PCs or the compatibles. In any case, the adoption of DBASE III in this training program does not preclude the participants from adapting the methodology and approach used in the training program to other data base management software, including newcomers like PARADOX (version 1.1); and

- LOTUS 123 (version 2) has been chosen as the spreadsheet software package largely because of its popularity and its extremely user-friendly approach. Other softwares like VP- PLANNER which is claimed to have almost the same capabilities as Lotus 123, to other software like MULTIPLAN (version 2) which has the additional facility of liking different spreadsheets, could well be adopted, following the approach and methods used in the training program.

5.4 Summing up from the above, the structure of this training program could be visualized as follows:

| Module | Contents | Software |
|---|---|---|
| I | Basic concepts and computer applications | |
| | Unit 1: Issues & problems in educational planning,management and research | |
| | Unit 2: Microcomputer applications | |
| | Unit 3: Data requirements identification and assessment | |
| | | WORDSTAR |
| II | Development of the Education Management Information System | |
| | Unit 1: Data base construction | |
| | Unit 2: Information retrieval | |
| | | DBASE III<br>QUICKCODE III |
| III | The Use of the Education Management Information System for Management Control | |
| | Unit 1: Routine administration of schools and projects | |
| | Unit 2: Monitoring performance of education system | |
| | | DBASE III<br>QUICKREPORT |
| IV | The Use of the Education Management Information System for Planning | |
| | Unit 1: Diagnostic analysis of pupil flow | |
| | Unit 2: Forecasting enrollment in school | |
| | Unit 3: Forecasting teacher and other resource requirements | |
| | | LOTUS 123 |

It may be noted above that the use of WORDSTAR (version 3.3 or 2000) will be demonstrated when Module 1 is presented to the participants so that they may after the training program be able to use wordprocessing software for report writing.

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# Module IV

## The Use of the Education Management Information System for Planning

### 1. Purposes

1.1 Module Performance Objectives. The purpose of this module is to present to the participants the use of a spreadsheet software package like Lotus in their diagnostic study of pupil flow and in formulating educational plans. On completion of this module, the participants should be able to:

(a) Have a firm grasp of the different pupil flow models for analysing the internal efficiency of the school system, and to compile projections of future enrollment;

(b) Have an understanding of how to relate the student flow model to other planning assignments such as the projection of teacher and textbook requirement and demand for school facilities;

(c) Use a microcomputer spreadsheet software program such as Lotus 123 to perform the above tasks.

1.2 The emphasis placed in this Module is as follows:

(a) To highlight the potentials of a simple spreadsheet program like Lotus 123 which planners could exploit to reduce considerably the response time needed in answering the so-called "what if" questions often posed by policymakers;

(b) To stress the interrelationship between different education programs like the program to build more schools in order to increase the proportion of school-age children enrolled in schools and the teacher training program. These interrelated programs could easily be incorporated into an integrated model of enrollment forecasts, teacher requirements and provision of school facilities, using simple spreadsheet techniques.

1.3 Although the spreadsheet program Lotus 123 is chosen for this Module, other programs like VP-Planner and Multiplan can be employed. Lotus 123 is chosen partly for its popularity and mainly for its extremely user-friendly approach adopted. After going through the practical exercises given in this Module, the participants should have a working knowledge of the main features of this package, except for such facilities as macros which are useful in data base management. The participants could experiment with these facilities on their own.

1.4 At the end of this Module, participants will soon realize that the life of planners will completely be changed with the use of microcomputers. Instead of having to devote most of their time calculating pupil flow and other quantitative implications of different policy options, they find they have to compete with the computers in dreaming up new planning alternatives. Otherwise they will be sitting by their drawing boards with nothing to do, as the microcomputers can very quickly produce the results with all the financial implications calculated for dozens of options devised by planners. The educational planners can no longer say that because of the lack of time, only a few options have been tried out.

## 2. The Organization of the Module

2.1 This Module is organized into three units as follows:

(a) Unit 1 on the diagnostic study of pupil flow, which provides a means of analysing the internal efficiency of the school system and prepares the ground for the subsequent projection of pupil enrollment;

(b) Unit 2 on the projection of school enrollment:

(c) Unit 3 on the related projection of teacher requirement and requirement for school facilities. The integration of the different projection models will also be demonstrated in this Unit.

2.2 The Module has to be organized in such a manner which would present to the participants in a logical sequence the various steps involved in planning. At the same time, it has to demonstrate to the learners the use of the spreadsheet program Lotus 123, starting from the basic techniques to the more advanced ones. Special arrangement has to be made to synchronize the two requirements in the practical sessions in Unit 1. In this unit, the internal efficiency model will be presented to the learners. The learners are however not required to develop this model themselves until they have gone through Unit 3. What is expected from them is simply to understand how the model works.

## II. Unit 1: Diagnostic Analysis of Student Flow

### 3. Performance Objectives

3.1 On completion of this unit, the participants should have:

(a) An understanding of the different models which could be used to analyse the movement of students in the school system;

(b) An appreciation of how internal efficiency indicators could be compiled from pupil flow models;

(c) A working knowledge of the use of Lotus 123 in building simple spreadsheet depicting the flow of pupils through the school system.

### 4. Instructional Activities

#### 4.1 The Tasks of Educational Planners

4.1.1 The work of planners is essentially to design education programs to achieve the objectives of education. There are, however, many objectives of education. A method has yet to be devised to help planners and policymakers in ranking and incorporating all these objectives in educational planning and policymaking. It is not proposed to go into details the diverse tasks of the educational planners. For the purposes of this Module and at the risk of over-simplification, it would be sufficient to view the tasks of educational planners as ones evolving around two major questions:

(a) How much education for how many?
(b) What kind of education and for whom?

4.1.2 To effectively answer these two questions, the planners have to know, first of all:

(a) How many are being educated,
(b) For how long, and
(c) Who is promoted to what type of education?

Regular surveys of schools provide information on who are being educated and in what types of schools. This kind of stock data, however, cannot give the planners an idea of how long a child has been or will be retained in the school system, and how children are promoted into different grades or types of schools/educational institutions. The latter kind of information is the so-called flow data which have to

be derived from the stock data or obtained from other sources.

## 4.2 Data on Pupil Flow

4.2.1 The ideal method of collecting data on pupil flow is to actually trace the pupils throughout the years when they are enrolled in schools. This kind of study, commonly known as the tracer or longitudinal study, requires detailed records be kept and updated on individual pupils as long as they remain in schools. This could be achieved by having an individualized data base of all pupils in the school system, and the data base has to be regularly updated. To do this, however, requires the maintenance of a huge data base and an elaborate system of identifying movement of individual pupils in the school system. The size of the data base could be reduced by including only a sample of pupils in the study. A number of sampling techniques can be employed to select a representative sample. Yet the task of avoiding dropouts over time from the panel of pupils included in the sample is as difficult as the job of conducting a complete registration of all pupils at regular time intervals. Not many countries in the world succeeded in maintaining a data base covering all or a sample of pupils in the system.

4.2.2 Another approach is to make use of administrative procedures like the registration of pupils for public examinations, at different points in a pupil's education career, to help build up and maintain a register of all pupils. This system should be able to cover almost all pupils in the school system. This would obviate the need for mounting special surveys of pupils to update the register. However, since there are not many public examinations which are held at different stages of the education ladder from primary to tertiary, and in view of the increasing unpopularity of having too many public examinations in many countries, the prospects of using such an approach to create an updated register of all pupils is not promising at all.

4.2.3 The most commonly adopted method is to compile flow data from stock data collected over consecutive points in time. Depending on the availability of statistics, a number of so-called cohort survival methods have been developed to provide the flow information required by planners. These cohort survival methods will be discussed later on in this unit.

## 4.3 Indicators of Internal Efficiency

4.3.1 In performing the planning tasks mentioned in paragraph 4.1 above, the planners need to have some kind of guideline or criteria which would enable them to choose from

a number of alternatives. For example, what should be the proportion of children who should be provided school places at the post-compulsory level of education (i.e., upper secondary level). Furthermore, planners need to know what are the problems in the implementation of, for example, universal primary education. Giving every child 6 years of primary education is quite different from ensuring all children finish Primary 6, if the repetition is not insignificant. Broadly speaking, there are two main criteria:

(a) The question of equity;
(b) The question of efficiency which could further be classified into internal and external efficiency.

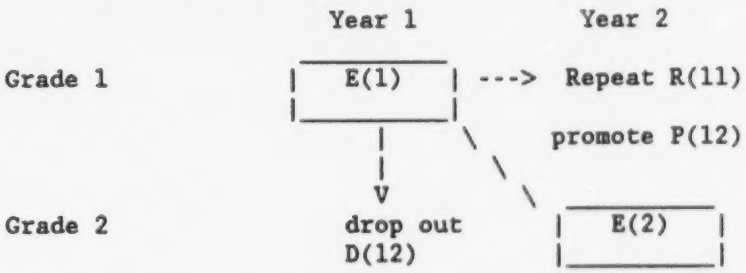
4.3.2 One of the topics covered in this unit is the question of internal efficiency, which in short represents how efficient the school system is operating. Indicators of internal efficiency include such estimates as the repetition and dropout rates, which can be derived from the flow data. In addition, there are other indicators like the "input/output ratio" which cannot be directly computed from the flow model. They have derived from the "Reconstructed Cohort Method" which will be discussed in this unit, using data on pupil flow.

## 4.4 Models of Pupil Flow

4.4.1 A model of pupil flow can be conceived by examining how a pupil would progress in the school system, upon completion of a grade. A great variety of flow models have been developed, ranging from simple ones which only analyse the enrollment statistics by grade for a number of years, to a sophisticated one which takes into account repetition and new entrants. The flow model can cover only one cycle of education, say primary, or can be extended to encompass the whole of the formal education system from primary to university education. Flow models for the nonformal sector is more difficult, if not impossible, to construct. This is because for the nonformal education sector, the notion of education ladder does not exist. Therefore, it is not easy to tell how pupils in the nonformal sector "progress" from one level to another.

4.4.2 Very briefly, a flow model attempts to simulate the manner in which pupils progress through the education system, from the point they start enrolling in school to where they graduate. From a pupil enrolled in any given grade, at the end of the school year, the pupil will either be promoted to a higher grade, or repeat the same grade or drop out of the school system. The different routes are depicted below:

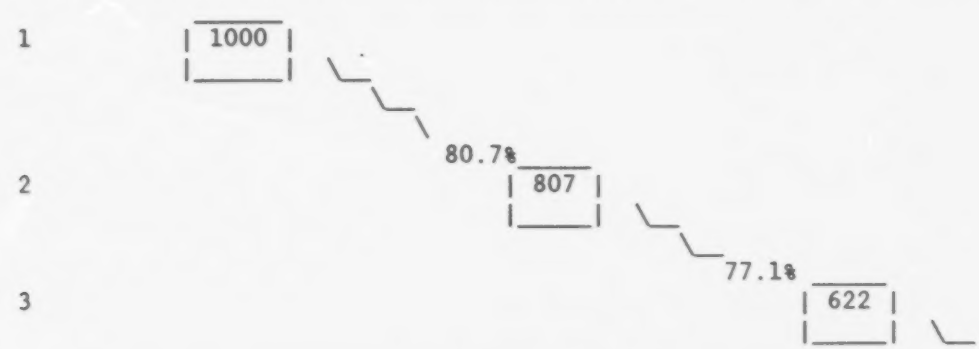
Figure I: Movement of Pupil Between Grades




Different flow rates may be computed from the above diagram. For instance, if information is available on the enrollment in grade 1 in year 1 and the enrollment in grade 2 in year 2, it is possible to estimate the combined effects of dropout, repetition and promotion. If additional information is available on repetition (i.e., R(1) above), then it is possible to estimate both the number of dropouts and the number of pupils promoted to grade 2. What is discussed below are three different models of pupil flow which are developed to analyse the movement of pupils between grades as depicted in Figure I above.

4.4.3 Grade Retention Model. This model is developed for countries which do not yet have a sophisticated system of education statistics. What are available are simple statistics on the number of pupils enrolled in each grade collated usually from the routine censuses of schools which are conducted in every academic year. In other words, only E(1) and E(2) in Figure I above are available. What planners have to do is to estimate the approximate promotion rates or the retention rates of pupils when they progress from one grade to the next. If the rate of repetition does not change drastically over time, this method could provide a rough analysis of the retention power of the education system. If the rate of repetition does not differ significantly for different grades, the approximate promotion rate can be used to assess the number of dropouts from the school system. Furthermore, the approximate promotion rates could be used as the basis for forecasting future enrollment in the school system. The following diagram shows the working of this method:

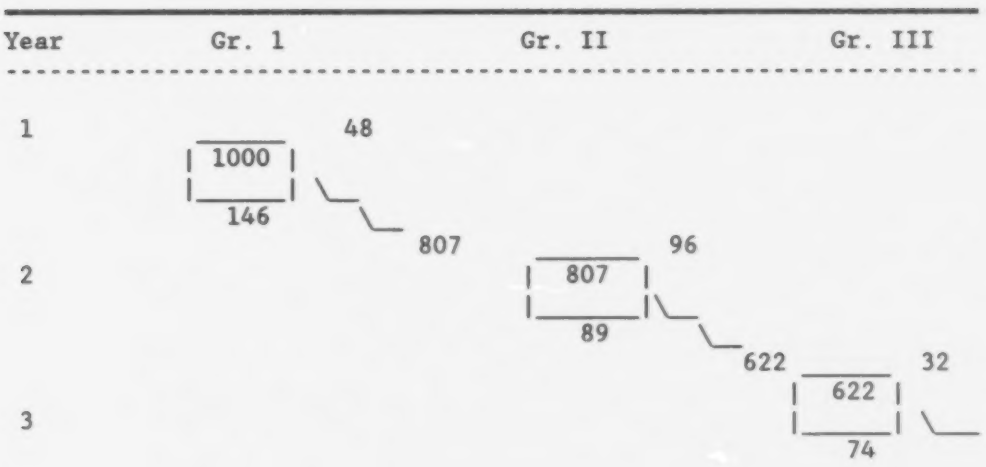
Figure II. Pupil Flow Using the Grade Retention Model




For any given cohort of pupils, the 1,000 pupils entering grade 1 in year 1, the approximate promotion of this group of pupils is given by dividing the enrollment in grade 2 in year 2 (i.e., 807) by the enrollment in grade 1 in year 1 (which is 1000). The approximate promotion rate between grade 2 and grade 3 for year 3 can similarly be calculated by dividing the enrollment in grade 3 in year 3 (i.e., 622) by the enrollment in grade 2 in year 2 (i.e., 807). If statistics are available on the enrollment by grade for any two consecutive years, the approximate promotion rates can be computed for the various grades. To compute these rates manually would take quite some time, especially if the time series is long. In the user manual section, the participants will be introduced to the techniques of Lotus 123 to perform these calculations virtually within seconds.

4.4.4 Grade Transition Model. This model is quite a popular model used in analyzing student flow. The model requires information on the number of repeaters by grade. As shown in Figure I above, estimates of actual promotion rates and dropout rates can be computed from statistics on enrollment and repetition. For enrollment at the compulsory level of education, estimates of the number of dropouts are extremely important in assessing the effectiveness of any program to provide universal basic education for children. The mechanisms of the model are shown in the diagram below:

Figure III: Pupil Flow Using Grade Transition Model




It may be seen from the above diagram that the number of dropouts between grade 1 in year 1 and grade 2 in year 2 is given by deducting from the enrollment in grade 1 in year 1 (i.e., 1000) the number of pupils who repeat grade 1 in year 2 (i.e., 146) and the number promoted to grade 2 in year 2 (i.e., 807). The dropout rate between grade 1 and grade 2 is thus given by dividing the number of dropouts (i.e., 48) by the total enrollment in grade 1 in year 1 (i.e., 1000).

4.4.5 It should be noted that the two models presented above are highly simplified. The purpose is just to show the basic mechanisms of the models. These models have not taken into account admission to grade 1, graduation at the terminal grade as well as new entrants. For the use of the models at the provincial or district level, it would be necessary to take into account new entrants, especially if migration between districts is significant to result to transfers of pupils between schools in different districts. The detailed workings of the two models will be demonstrated in the User Manual Section, using Lotus 123. Therefore, it is not proposed to repeat the description of the two models here.

## 4.5 Indicators of Internal Efficiency

4.5.1 Put in its simplest terms, a measure of the internal efficiency of a school system can be obtained by comparing the inputs of resources into the school system against its outputs. While assessing inputs is relatively easy, measuring outputs from the education system encounters not only the problems of measurement, but also the conceptual difficulties in defining what are regarded as "outputs." The

crudest measure of outputs is the number of pupils graduating. Admittedly, this is not a very satisfactory measure. For example, for those pupils who fail to graduate, the resources invested in them should hardly be considered as totally wasted. Hence, the crude measure mentioned above should at least be improved to include estimates of the number of pupils dropping out of the school system at various points of their school career. Alternatively, the internal efficiency of a school system can be assessed from its ability to retain pupils in the school system, before they reach the terminal grade. Regardless of whether internal efficiency is assessed on the basis of the input/output comparison or the ability of the school system to retain pupils, one inevitably has to study the progression of pupils through the school system.

4.5.2 As pointed out above, the ideal approach to studying student flow is the use of an update register of pupils, so that the life history of pupils can be traced. A less expensive system has been proposed by some, using the "cohort coding system." Under this system, pupils having the same education experience will be given the same code number. For example, pupils repeating grade 2 and grade 4 will be given a code like "12234456", whereas pupils who do not repeat at all in their 6 years or primary education will be given a code of number of "123456." Those who drop out from schools after repeating one year in grade 3 and after completing only grade 4 will be assigned the code number of "12334." By analysing the distribution of pupils with different code numbers, one can estimate the number of pupils who eventually graduate, and the number of who drops out after spending 2, 3, or 4 years in schools. While this system is relatively less expensive to maintain, it has to be monitored carefully to ensure that pupils are given the correct code numbers. Furthermore, a separate data collection exercise, apart from the usual surveys of school enrollment, has to be conducted regularly to collate the necessary statistics. In short, it is not as simple as originally conceived by its creators.

4.5.3 Reconstructed Cohort Method. A simplified approach has been developed to study the internal efficiency of the school system. This is the reconstructed cohort method which makes use of the grade transition model presented above. Very briefly, the method attempts to "reconstruct" the school career of a hypothetical cohort of pupils, based on given rates of repetition, promotion and dropout. The following assumptions have been built into this method:

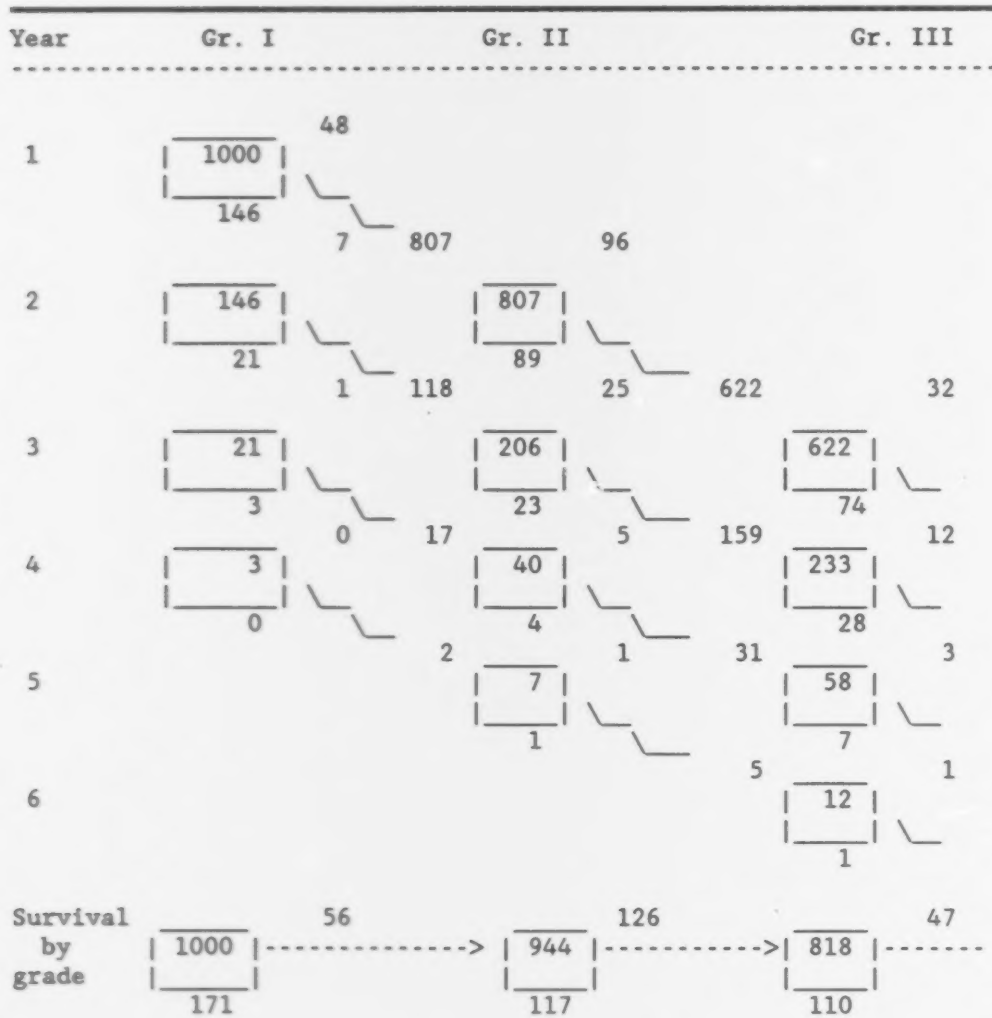
(a) The rates of repetition, promotion and dropout are assumed to remain constant through the whole school career of the cohort of pupils;

(b) For pupils who repeat a certain grade in a given year, they will experience the same rates of repetition and promotion as other pupils who have not repeated, or who have repeated more than once. This assumption is highly debatable, and is considered as the major drawback of this method.

The following diagram depicts the basic working of the reconstructed cohort method:

Figure IV: Reconstructed Cohort Method

(Based on a cohort of 1000 pupils in Grade 1)



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It may be seen from the above flow diagram that pupils are assumed to repeat for a maximum of three times in any one grade. Thus, for the 146 pupils who repeat grade 1 in year 2, some 21 of them will repeat grade 1 again in year 3, and another 3 will repeat grade 1 again in year 4. All of them will experience the same probability of repetition, promotion and dropout in grade 2 or higher.

4.5.4 The rates of repetition, dropout and promotion assumed in calculating the flow diagram above are shown in the following table:

Figure V: Assumed Flow Rates in the Reconstructed Cohort Model

| Grade | 1 | 2 | 3 |
|---|---|---|---|
| Promotion rate | 80.7% | 77.0% | 83.0% |
| Repetition rate | 14.6% | 11.0% | 11.8% |
| Dropout rate | 4.8% | 11.9% | 5.1% |

The participants may wish to use the above rates to go through some of the calculations in Figure V above. In the User Manual Section, the working of the model will be demonstrated using Lotus 123. The assumed flow rates could easily be changed, the figures in the model being calculated quickly by the program.

4.5.5 A number of useful indicators of internal efficiency can be compiled from the reconstructed cohort model. What is given in the bottom of the diagram in Figure IV is the estimated number of pupils staying in the school system by grade. For instance, out of the 1000 pupils who start grade 1 in year 1, 944 manage to enroll up to grade 2. Of them, 818 pupils enroll up to grade 3. For the dropouts, 36 pupils drop out after attending only grade 1, another 126 drop out after attending school up to grade 2, and a further 47 drop out after attending grade 3. More indicators can still be compiled from the model, including:

(a) The average number of years spent in school before a pupil graduates. This is a useful indicator in estimating the average time taken to produce a graduate;

(b) The average number of years spent in school before a pupil drops out of school. This gives another indication of the retention power of the school system. Given dropout may not represent a complete waste of

resources, this indicator at least gives a crude idea of the "amount" of education received by those pupils who are not able to complete their schooling;

(c) A commonly sought for indicator is the so-called input/output ratio of the school system, being a proxy indicator of internal efficiency. Input represents the amount of resources, expressed in terms of the number of pupil-years, invested in the school system, whereas output can be represented by the product of the number of graduates and the number of years they are expected to remain in schools before graduation. Thus, if a school system is efficient, an input of 6000 pupil-years would be required to produce 1000 graduates given that the normal length of the school cycle is 6 years. If average unit costs of providing a place in the school system is taken into account, one can compile what is known as the cycle cost from the model.

## 5. User Manual

### 5.1 Getting Started

5.1.1 Throughout the entire module, the spreadsheet program Lotus 123 will be used to demonstrate the practical exercise. This program is almost completely menu-driven and is extremely easy to use. Therefore, it is not proposed to repeat what will be shown on the Lotus screen in this Section. Therefore, the command steps given in this Section are relatively brief. Given that the spreadsheets used in this model have already been developed, the participants should have little difficulty following the program.

5.1.2 Lotus 123 is an integrated spreadsheet, graphics and data base software. It will not be possible to explore the data base capabilities of Lotus 123. The techniques of data base management have been discussed extensively in Modules II & III, using a relationship data base management system DBASE III. The graphics capability of Lotus 123 will also not be discussed in this module. The participants who have mastered the techniques in building spreadsheet programs to help do their planning should have little difficulty turning their data into graphics.

5.1.3 Lotus 123 can be run on any IBM PC/XT or its compatibles. The program requires a minimum of 192K of memory. All the spreadsheet programs are stored in the Diskette "EPP Mod.v.4." For systems with two floppy disk drives, the Lotus system can be started up from either Drive A or Drive B, with the data diskette placed in other drive. For systems with a hard disk and a floppy disk, the Lotus

system has to be started from Drive C, with the data diskette placed in Drive A.

5.1.4 It is recommended to make a copy of the Diskette and use the duplicate in the practical session. All Lotus 123 commands shown in this Module are written in this Module are written in UPPER CASE and enclosed by [ ].

## 5.2 The Grade Retention Model

5.2.1 In this subsection, the participants will be introduced to a simple grade retention model. The model is constructed using data on primary education. It will be shown how one can estimate flow rates from stock data. As discussed above, the Grade Retention Model is used for a school system where no information is available on the number of repeaters by grade. The model is stored in the Lotus file FLOW1.WK1.

5.2.2 In this subsection, the participants will be introduced to the basic techniques in creating a simple worksheet:

(a) moving around worksheet;
(b) entering labels and numbers;
(c) writing formulae;
(d) automatic recalculations of the figures in the worksheet;
(e) saving and retrieving worksheets.

5.2.3 Moving Around Worksheet. To create any worksheet like FLOW1, users have to be able to move around in the worksheet. Provided there is sufficient memory to hold the worksheet, it can be as large as 256 columns wide and 2048 rows long. There are a number of ways of doing so:

(a) The use of the cursor control keys, the functions of which are similar to those of many software packages like Wordstar. The special cursor key [Home] will bring the cursor back to the cell address [A1]. Pressing [PgDn] will bring the cursor down by 20 rows, while pressing [PgUp] brings the cursor up by 20 rows;

(b) The use of the function key [F5] to go to a given cell address;

(c) The use of the [TAB] key to move to the next screen to the right. Pressing [TAB] key with the [SHIFT] key held down will move to the next screen to the left.

5.2.4 The participants are suggested to have to look at the worksheet on the grade retention model by retrieving it from the Diskette "EPP Mod.v.5." A file can be retrieved by:

(a) First bringing up the Lotus menu by pressing [/];
(b) Then selecting the file menu by pressing [F];
(c) And the retrieve option can be selected by either pressing [R] or moving to cursor over the RETRIEVE entry and press [ENTER];
(d) A list of Lotus files will appear on the top of the screen. The file FLOW1 can be selected by typing [B:FLOW1] and then [RETURN].

It would be useful to move around the worksheet to see what the FLOW1 worksheet looks like, using the methods described in paragraph 5.2.4 above.

5.2.5 Entering Labels and Numbers. It will be demonstrated in this subsection how to create a simple worksheet like FLOW1. There are two steps involved in building the FLOW1 worksheet. One is the entering of labels and numbers into the worksheet. The following procedures may be followed:

(a) The worksheet on FLOW1 can be cleared by:

    (1) first bringing up the Lotus menu with [/];
    (2) then selecting the worksheet menu with [W];
    (3) and finally erasing command with [E] or moving the cursor over to ERASE and press [ENTER];

It is advisable to always make sure that a copy of the worksheet is already saved before erasing it;

(b) Labels can be entered by just typing them over the cell which users want to place. One can move around different parts of the worksheet using the techniques described above. Needless to say, it is always advisable to plan ahead a rough sketch of what the worksheet will work like. Once the first character is typed into the screen, the mode indicator of Lotus will respond and the READY mode will change to the LABEL mode. If the label is too long for the cell to contain, the label will extend beyond the cell if the cell next to it is empty;

(c) Numbers can be entered into the worksheet in the same manner as labels.

The following table gives the initial design of the grade transition model after the labels and numbers have been entered into the worksheet. It may be recalled that the grade transition model makes use of only enrollment by grade for a

number of years to estimate the approximate promotion rates. Therefore, the next step in building the FLOW1 worksheet is to tell Lotus system how to calculate the grade retention rates from grade 1 to grade 6 for 1974-1978.

Figure VI: Worksheet A of Grade Transition Model

Simple Model of Student Flow

| | Year | | | | |
|---|---|---|---|---|---|
| Enrollment | 1974 | 1975 | 1976 | 1977 | 1978 |
| Primary 1 | 3446835 | 3552671 | 4002377 | 4331285 | 4929754 |
| Primary 2 | 2829095 | 3067592 | 3253994 | 3747117 | 3955770 |
| Primary 3 | 2501138 | 2512291 | 2822812 | 3120022 | 3466353 |
| Primary 4 | 2003492 | 2099223 | 2217059 | 2538736 | 2770132 |
| Primary 5 | 1627590 | 1682093 | 1811199 | 1944685 | 2242429 |
| Primary 6 | 1299716 | 1366288 | 1442683 | 1583446 | 1710381 |

5.2.6 Entering Formulae. The formula is used to calculate the value of a cell, using other numeric values already entered in other cells. To calculate the approximate grade promotion rate for Primary 1 to Primary 2 for 1974-75, one would have to divide the enrollment in Primary 1 in 1974 (i.e., 3446835) by the enrollment in Primary 2 in 1975 (i.e., 3067592). Formulae may be entered by:

(a) either typing directly the cell addresses for the two values, i.e., [+cell address for 3446835/cell address for 3067592];

(b) or using the pointer to the addresses of the cells in question:

(1) press [+];
(2) then move the cursor to the cell for enrollment in Primary 1 in 1974;
(3) press [/];
(4) and then move the cursor to the cell for enrollment in Primary 2 in 1975;
(5) press [ENTER] to complete the formula.

Immediately after the formula has been entered, the approximate promotion rate for P.1-P.2 in 1974-75 will automatically be calculated.

After formulae for all the retention rates have been assigned, one would have completed developing the grade retention rates in Lotus worksheet. The following diagram shows the complete grade retention model:

Figure VII: Worksheet B for Grade Retention Model

I. Enrollment by Grade

| Grade | Year 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|
| Primary 1 | 3446835 | 3552671 | 4002377 | 4331285 |
| Primary 2 | 2829095 | 3067592 | 3253994 | 3747117 |
| Primary 3 | 2501138 | 2512291 | 2822812 | 3120022 |
| Primary 4 | 2003492 | 2099223 | 2217059 | 2538736 |
| Primary 5 | 1627590 | 1682093 | 1811199 | 1944685 |
| Primary 6 | 1299716 | 1366288 | 1442683 | 1583446 |
| Total | 13707866 | 14280158 | 15550124 | 17265291 |
| (% change) | | 4.174916 | 8.893220 | 11.02992 |

II. Approximate Grade Retention Rates

| | | | |
|---|---|---|---|
| P.1-P.2 | 88.99735 | 91.59288 | 93.62228 |
| P.2-P.3 | 88.80193 | 92.02045 | 95.88284 |
| P.3-P.4 | 83.93071 | 88.24849 | 89.93641 |
| P.4-P.5 | 83.95805 | 86.27949 | 87.71462 |
| P.5-P.6 | 83.94546 | 85.76713 | 87.42529 |

5.2.7 The worksheet has to be saved before one exits the Lotus system. In fact, it is always recommended to save a worksheet from time to time, even if it is not yet completed. Copying the worksheet from the memory to the diskette will only take a few moments. The worksheet may be saved by:

(a) pressing [/] to bring up the menu;
(b) pressing [F] to select the file menu;
(c) pressing [S] to choose the save command. Responding to the program's request for a file name, one may type [FLOW3] or any other file name which is easy to remember.

5.2.8 Finally, before leaving this subsection, it would be useful to explore the calculating power of a Lotus worksheet. If the enrollment figures in the grade retention model are changed, the retention rates will change accordingly. One can change the enrollment figures in the worksheet just created by moving the cursor to the cells where changes are desired, and simply type in the new figures. If the Lotus system is not set to automatic recalculation, pressing [F9] will cause the system to recalculate all the retention rates within seconds.

## 5.3 Grade Transition Model

5.3.1 As discussed above, the grade transition model is a more sophisticated version of the pupil flow model. To construct the grade transition model requires statistics on enrollment by grade as well as the number of repeaters by grades. The formulae required to calculate the number of dropouts, dropout and promotion rates are also more complicated than the one used in the grade transition model. In this subsection, the powerful COPY command of Lotus will be introduced to make the development of the grade transition model easier.

5.3.2 A grade transition model has been constructed on Lotus worksheet and is stored in the file named FLOW2. This file can be retrieved by the [/FR] and then selecting the drive and the file name FLOW2. The worksheet will look something like the diagram below:

## Figure VIII: Worksheet for Grade Transition Model

I. Enrollment by Grade

| Grade | Year 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|
| Primary 1 | 3446835 | 3552671 | 4002377 | 4331285 |
| Primary 2 | 2829095 | 3067592 | 3253994 | 3747117 |
| Primary 3 | 2501138 | 2512291 | 2822812 | 3120022 |
| Primary 4 | 2003492 | 2099223 | 2217059 | 2538736 |
| Primary 5 | 1627590 | 1682093 | 1811199 | 1944685 |
| Primary 6 | 1299716 | 1366288 | 1442683 | 1583446 |

II. Repeaters by Grade

| | | | | |
|---|---|---|---|---|
| Primary 1 | 336780 | 325688 | 394366 | 402151 |
| Primary 2 | 224343 | 252012 | 261238 | 284639 |
| Primary 3 | 172323 | 170001 | 182324 | 192526 |
| Primary 4 | 92158 | 95446 | 100125 | 102524 |
| Primary 5 | 56965 | 58800 | 63000 | 68600 |
| Primary 6 | 33465 | 35212 | 37001 | 39556 |

III. Estimated Number of Dropouts

| | | | |
|---|---|---|---|
| P.1-P.2 | 305567 | 165549 | 137748 |
| P.2-P.3 | 234793 | 165866 | 41859 |
| P.3-P.4 | 327360 | 213033 | 194074 |
| P.4-P.5 | 284753 | 250899 | 238450 |
| P.5-P.6 | 237714 | 213411 | 198709 |

IV. Repetition Rates (%)

| | | | | |
|---|---|---|---|---|
| Primary 1 | 9.770702 | 9.167412 | 9.853294 | 9.284796 |
| Primary 2 | 7.929850 | 8.215303 | 8.028226 | 7.596213 |
| Primary 3 | 6.889783 | 6.766771 | 6.458949 | 6.170661 |
| Primary 4 | 4.599868 | 4.546729 | 4.516117 | 4.038387 |
| Primary 5 | 3.499960 | 3.495645 | 3.478358 | 3.527563 |
| Primary 6 | 2.574793 | 2.577201 | 2.564735 | 2.498095 |

V. Estimated Dropout Rates (%)

| | | | |
|---|---|---|---|
| P.1-P.2 | 8.865147 | 4.659846 | 3.441654 |
| P.2-P.3 | 8.299226 | 5.407042 | 1.286388 |
| P.3-P.4 | 13.08844 | 8.479630 | 6.875201 |
| P.4-P.5 | 14.21283 | 11.95199 | 10.75523 |
| P.5-P.6 | 14.60527 | 12.68722 | 10.97113 |

5.3.3 In constructing the grade transition model, several formulae have to be entered into the worksheet:

(a) One is to calculate the number of dropouts. The number for P.1-P.2 in 1975 (i.e., 305567) is given by deducting from the enrollment in P.1 in 1974 (i.e., 3446838), the number of P.1 repeaters in 1975 (i.e., 325688) and the number of P.1 in 1974 who were promoted to P.2 in 1975. The number of P.1 in 1974 promoted to P.2 in 1975 is given by the difference between the P.2 enrollment in 1975 (i.e., 3067592) and the number of P.2 repeaters in 1975 (i.e., 252012). This formula can be entered into the cell for the number of dropouts for P.1-P.2 in 1975 following the procedure already described above;

(b) It is not recommended to repeat the same procedure as in (a) above in order to enter the same formula for calculating the number of dropouts in other grades and for other years. This can be accomplished using the COPY command:

(1) The copy command replicates the values or formulae from a single cell or a range of cells to a range of cells. The following table summarizes what a copy command can replicate:

| Source | Target |
|---|---|
| One cell | One cell |
| | a row of cells |
| | a column of cells |
| | a rectangular block of cells |
| a column of cells | a column of cells |
| | a rectangular block of cells |
| a row of cells | a row of cells |
| | a rectangular block of cells |
| a rectangular block of cells | a rectangular block of cells |

(2) There are generally four steps involved in a copy command:

- always position the cursor to the source cell to be copied from;
- [/] and [C] to select the copy command;
- identify the source cell or range of cells through the use of the cursor and then [ENTER];
- identify the target cell or range of cells by moving the cursor and then [ENTER];

(3) It should be noted that Lotus addressing works in relative terms. The COPY command copies the formula by retaining the relative positions of cells referenced in the formula. Thus, the formula is not copied exactly. For instance, copying the formula for calculating the number of dropouts for P.1-P.2 in 1975 to the cell which contains the number of dropouts for P.1-P.2 in 1976 will also change the contents of the formula for the target cell so that the new formula will deduct from the enrollment in P.1 in 1975 rather than in 1974, the number of pupils promoted to P.2 in 1976 instead of 1975.

(c) Once the technique of copying is mastered, it will be relatively easy to enter another two sets of formulae into the worksheets:

(1) The formula to calculate the repetition rates. For instance, the repetition rate for P.1 in 1975 is given by dividing the number of repeaters in 1975 by the P.1 enrollment in 1974 and then times 100 to convert the rate into percentage terms;

(2) The formula for calculating the dropout rates. The dropout rate for P.1-P.2 in 1975 is given by dividing the number of dropouts in 1975 for P.1-P.2 by the P.1 enrollment in 1974 and then times 100 to convert the rate into percentage terms;

## 5.4 Internal Efficiency Model

5.4.1 An internal efficiency model has been developed on Lotus worksheet and is stored in the file named EFFIC. It is not proposed at this stage to go into detail about the construction of the model. The working of the model will be demonstrated in this subsection. First of all the first EFFIC can be retrieved by [/], [F], [R] and then select the drive and file name. Since the worksheet is quite large, it is necessary to move the cursors around to see the entire worksheet.

5.4.2 Part of the internal efficiency model is shown in the diagram below:

## Figure IX: Internal Efficiency Model

Province: NTB — District: all
Sex: all — Subdist: all

| Primary Grade | Gr. 1 | Gr. II | Gr. III |
|---|---|---|---|
| 1983 Enrollment | 130,000 | 110,000 | 90,000 |
| 1984 Enrollment | 123,113 | 116,968 | 95,463 |
| Repeaters | 18,944 | 12,123 | 10,663 |
| 1983 Promotion rate | 80.7% | 77.1% | 83.0% |
| Repetition rate | 14.6% | 11.0% | 11.8% |
| Dropout rate | 4.8% | 11.9% | 5.1% |

Total output = 669

Total pupil-years = 5524

Total drop-outs = 324

Total repeaters = 581

| Average study time | | |
|---|---|---|
| Graduate | Dropouts | Cohort |
| 6.64 | 3.18 | 5.47 |

| Instructional yrs/graduate |
|---|
| 8.25 |

| Average unit cost/place (Rp) |
|---|
| 78,948 |

| Pupil-years wasted | | |
|---|---|---|
| Total | Repeaters | Dropouts |
| 1508 | 430 | 1079 |

| Input-output ratio |
|---|
| 1.38 |

| Cost per graduate (Rp) |
|---|
| 651,637 |

The main feature of the model is that it will calculate the dropout, repetition and promotion rates, as well as a number of indicators of internal efficiency from statistics on enrollment by grade for any two consecutive years and number of repeaters by grade for the last year. The formulae for calculating the three flow rates are based on the grade transition model just described in section 5.3 above. The promotion rates is equal to 1 minus the rates of repetition and dropout. Based on the flow rates calculated, a reconstructed cohort model can be developed, the method of which is already demonstrated in the earlier part of this Unit.

5.4.3 It would be useful to move around the worksheet and to study the formula for each of the indicators listed above. This can be done by simply placing the cursor in the cell in the question and the formula will appear on the top of the worksheet. For example:

(a) The average number of years spent by graduates is calculating by first, aggregating the number of graduates who take 6 years to finish primary (i.e., 358) multiplied by 6, the number of graduates who take 7 years (i.e., 214) multiplied by 7, the number of graduates who take 8 years (i.e., 76) multiplied by 8, and the number who take 9 years (i.e., 21), and then dividing the aggregated number by the total number of graduates (i.e., 669). The relevant part of the worksheet is shown below:

(b) The total number of pupil years spent by the cohort of 1000 pupils (i.e., 5524) is also shown in the diagram above. The number is obtained by summing the number of survivors in each year;

(c) At the upper right hand corner of the boxes for the number of survivors by year is the estimated number of dropouts at the end of the year concerned. Thus, summing up the number of dropouts for each year gives the total number of pupil-years spent by these dropouts. The average number of years these dropouts spend in the school system can be estimated by dividing the total number of pupil-years spent by dropouts by the total number of dropouts.

5.4.4 A number of indicators may be constructed from this model, some of which are shown in Figure IX above:

(a) Indicators of Retention by Grade

(1) The number of survivors by grade, which is shown in Figure IV above. One may distinguish the flow rates such as promotion, repetition and dropout rates computed from the flow models which refer to the flow of pupils between any two consecutive years, from this indicator which shows what would eventually happen to the cohort of pupils when all those who repeat have finally dropped out or are promoted;

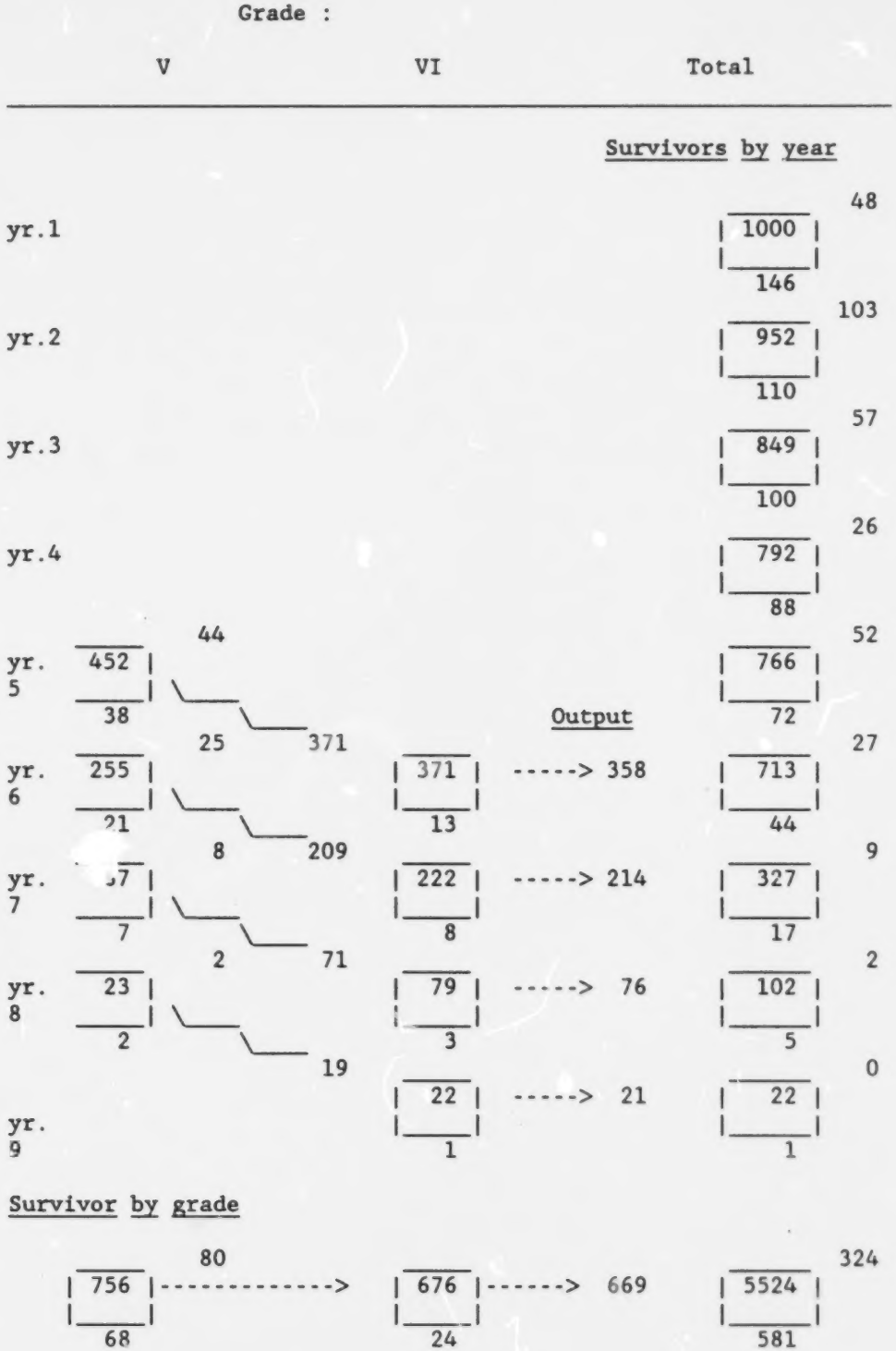
(2) The number of dropouts by grade, which is also shown in Figure IV above. This gives a useful indication of the number of grades pupils will complete before leaving schools prematurely;

(3) Number of graduates from the final grade, which represents an estimate of the output from the school system for every 1000 cohort of pupils, based on the assumed rates of repetition and dropouts. For setting targets which are related to the projected requirement for school leavers, this will be a very useful indicator;

(b) Indicators of Retention by Years Spent in School

(1) Number of survivors by years spent in school, which is shown in the diagram given in paragraph 5.4.3(a) above;

(2) Average number of years spent in school by graduates, as discussed in paragraph 5.4.3(a);


Grade :
V
VI
Total
Survivors by year
yr.1
1000
146
48
yr.2
952
110
103
yr.3
849
100
57
yr.4
792
88
26
yr. 5
452
38
44
766
72
52
25
371
Output
yr. 6
255
21
371
13
-----> 358
713
44
27
8
209
yr. 7
57
7
222
8
-----> 214
327
17
9
2
71
yr. 8
23
2
79
3
-----> 76
102
5
2
19
yr. 9
22
1
-----> 21
22
1
0
Survivor by grade
756
68
80
676
24
------> 669
5524
581
324

(3) Average number of years spent in school by pupils who will leave school prematurely, as discussed in paragraph 5.4.3(c);

(c) Indicators of Wastage and Efficiency

(1) Total number of pupil-years wasted by graduates on repeating. This can be obtained by aggregating the number of pupils who take 7 years (instead of the normal duration of 6 years) to complete primary schooling (i.e., 214 in the diagram given in paragraph 5.4.3(a)) multiplied by 1, the number who take 8 years multiplied by 2, and the number who take 9 years multiplied by 3;

(2) The input-output ratio as discussed in paragraph 4.5.5(c) above. The ratio may be obtained by dividing the total number of pupil-years spent by the cohort of 1000 pupils in school, by the product of the number of graduates and 6 years.

5.4.5 It may be noted several new LOTUS techniques have been used in developing the spreadsheet for analyzing internal efficiency:

(a) First of all, it may be noted the format of the worksheet is much better than the two worksheets on the flow models. This can be accomplished by:

(1) Formatting the width of the column to cope with different labeling and numbering requirements. For some labels, the column width has to be set to 1. For others, the column width has to be greater than the default value of 9. The LOTUS commands used to change column-width are:

- [/] to bring up the menu;
- [W] to select the worksheet menu;
- [C] to select the column-width command;
- [S] to select the set width command;
- [ENTER] to issue the command and then in respond the system request, enter the appropriate no. of characters for the column-width;

It may be noted that the column width can be as long as 240 characters. The default value of 9 characters can be changed using the worksheet status [\WS] commands;

(2) The alignment of labels. For columns which are wide, it is desirable to have the labels aligned so that the data which are numeric and are always aligned to the right, could be shown immediately below their respective titles. There are three special characters used by the LOTUS system in aligning labels:

- ( ' ) which will align labels to the left;
- ( " ) which will align labels to the right;
- ( ^ ) which will center labels.

The default is ( ' ) giving left-justified labels;

(3) The formatting of numbers. The LOTUS system shows numbers in the most efficient manner by using the minimum numbers of characters for numbers. By formatting the numbers, one can determine the number of decimal places to be displayed on screen, display percentages, display numbers with commas "," to show thousands, millions, etc. It may be noted that although a limited number of decimal places is shown on the screen, the LOTUS still keeps up to 15 decimal positions in its memory. The relevant command procedure is as follows:

- [/] to bring up the menu;
- [RF] to bring up the range format menu which allows users to specify the format for a range of cells;
- Then one can choose from the options available from the menu by simply moving the right cursor key ( -> ) or the left cursor key ( <- );
- [ENTER] and then specify the range of cells to be assigned the format just defined.

(b) It may also have been noted by moving around the worksheet that the backslash symbol (\) appears many times in the worksheet. This key allows users to repeat any label that follows the backslash in the cell concerned. Using this key will save a lot of typing time required to repeat a label;

(c) One of the function keys available in LOTUS to perform summation, @SUM, has been used in developing the spreadsheet. The function keys are built-in formulae which help users perform arithmetical, statistical as well as logical functions. The function @SUM (CELL 1..CELL2) sums up all numeric values in the range of cells from cell 1 to cell 2. The functions may be used in the same manner as entering formulae.

6. Learning Activities

6.1 Microcomputer Tutorial Sessions

6.1.1 The purpose of the tutorial sessions is to give your participants an opportunity to practice the various LOTUS commands discussed in the User Manual Section, and to modify the worksheets already developed in this unit.

6.1.2 In the first part of the tutorial sessions, the participants will be asked to go through the LOTUS commands used in the User Manual Section.

6.1.3 Then, in the second part, they will be asked to refine the format worksheets FLOW1 and FLOW2 following the procedure described in paragraph 5.4.4 above.

6.2 Group Work Session

6.2.1 The participants will be divided into groups. During the group discussion, the participants will be asked to comment on:

(a) The usefulness of the flow model in estimating the number of dropouts and analyzing internal efficiency;

(b) The shortcomings of the flow model when applied to analyzing the pupil flow in a particular province or district.

7. Post-assessment

7.1 The purpose of the post-assessment is to help the instructors to evaluate whether the learners are able to perform the tasks described in this unit. The learners are required to:

(a) Construct a simple flow model based on the information given in paragraph 7.2 below;

(b) Develop an internal efficiency model for the junior high school system, using the flow rates calculated from the flow model above.

7.2 Construction of Grade Transition Model. A simple flow model is required to be constructed for a subdistrict by the participants, with the help of the instructors:

(a) The flow model is in respect of the junior high school system in a subdistrict. The duration of study for the high schools is 3 years;

(b) It is assumed that data are available on the following:

(1) enrollment by grade for 3 consecutive years:

| Grade | I | II | III |
|---|---|---|---|
| year 1 | 300101 | 287664 | 254331 |
| year 2 | 321098 | 276554 | 253444 |
| year 3 | 364219 | 300567 | 256743 |

(2) number of repeaters by grade for 3 consecutive years:

| Grade | I | II | III |
|---|---|---|---|
| year 1 | 27864 | 26431 | 23217 |
| year 2 | 30010 | 28777 | 24903 |
| year 3 | 30211 | 24321 | 21078 |

(3) number of leavers from grade 6 in primary schools some of whom fail to be admitted into grade 1 in junior high school for 3 consecutive years:

| | |
|---|---|
| year 1 | 45646 |
| year 2 | 43408 |
| year 3 | 42127 |

(c) The learners are required to construct the grade transition model based on the above statistics. The model should be able to give the following indicators:

(1) The number of dropouts and dropouts by grade for the junior high school system;

(2) The rate of repetition by grade;

(3) The promotion rates by grade for the junior high school system;

(4) The number of grade 6 leavers from primary schools who fail to be admitted into junior high school;

(5) The promotion rate between grade 6 in primary and grade 1 in junior high schools.

(d) The learners may construct a crude worksheet, similar to the format of FLOW1 and FLOW2. But later they are required to refine the format of the worksheet, following the procedures outlined in paragraph 5.4.4.

7.3 Developing a Reconstructed Cohort Model. The learners will then proceed to develop a reconstructed cohort model using the transition rates computed from the flow model developed in paragraph 7.2 above.

## III. Unit 2: Projection of Enrollment

### 8. Performance Objectives

8.1 On completion of this unit, the participants should be able to:

(a) Apply the techniques of the pupil flow model to project future enrollment in schools;

(b) Appreciate how the different flow indicators, some of which may have policy implications, would affect demand for school places;

(c) Use the software package LOTUS 123 to develop worksheets for the projection of enrollment in schools, which can take into account different assumptions on the flow indicators.

### 9. Instructional Activities

#### 9.1 Different Methods of Projecting Enrollment

9.1.1 Pupil Flow Model. A flow model is constructed by planners to simulate the movement of pupils through the school system based on time series data on enrollment and repetition. Therefore, a natural extension of the use of the flow model is to apply it to forecasting future movement of pupils in the school system. This gives the projection of enrollment which is required in nearly all quantitative planning exercises, ranging from the planning of school building, teacher training, curriculum development, and the production of textbooks. The merits of employing the flow model are that:

(a) Planners can test the outcome of the enrollment forecasts by using different assumptions on the rates of repetition and promotion. In most circumstances, these rates can be affected by deliberate policy measures. For example, a certain maximum repetition rate can be imposed on schools as mandatory requirement. Standards set in the examination system for the selection of pupils for entry to junior high schools largely determines the progression rate from primary to junior high schools. These so-called policy variables often become the centre of heated educational or even political debates;

(b) Planners can also test the sensitivity of the projection models by changing the flow rates. This sensitive test

provides a means of assessing the probable range of errors of any enrollment forecasts using the flow model.

9.1.2 Time Series Analysis of Enrollment. A number of methods can be used to project future enrollment in school. One method is the use of time series analysis of historical enrollment data. Based on the past enrollment trend, the future enrollment size can be projected by a mere extrapolation of the past trends. A variety of statistical models are available for the projection exercise. A serious drawback of this method is that it fails to take into account demographic factors which determine the number of children available to become educated in the country or district concerned. For places where the proportion of children attending schools is high, where the rate of attendance can be or has to be determined as a policy variable, this method is definitely inadequate for the purposes of making enrollment projection.

9.1.3 Enrollment Ratio Method. This method overcomes the criticism raised in (a) above, by taking into account demographic factors. The additional statistical information required is:

(a) Historical data on enrollment, preferably analysed by age;

(b) Demographic data on past and future projection of population in the school-age group by age.

Using this method, one could derive the net enrollment ratios for the school system using historical data. The net enrollment ratio for primary education is defined as the proportion of the population in the primary school-age group who are enrolled in primary schools. Given a time series data on the net enrollment ratios, one can project the future enrollment by extrapolating from the past trend. Different statistical techniques may be used for such a projection which could also take into account a target ratio for any given year. By applying the forecasted net enrollment ratios to the projected number of children in the corresponding age group, one can derive the estimated number of children enrolled in schools for the forecast period.

9.1.4 Other forms of enrollment ratios like the gross enrollment ratio can be used to project the number of pupils in schools. The gross enrollment ratio for primary school is defined as the ratio of the total enrollment in schools to the number of children in the primary school-age group (7-13 years). If no statistics are available on the enrollment of pupils by age, the gross enrollment ratio has to be used in the projection.

9.1.5 It may be noted that the net or gross enrollment ratio can be computed for the whole primary level of education or for a particular grade. If ratios are compiled for different grades for primary education, estimates of future enrollment in individual grades can be obtained from a projection of the grade specific enrollment ratios and the projected population in the corresponding age groups.

9.1.6 The enrollment ratio method is commonly used in conjunction with the flow model method. There are several reasons for doing so:

(a) For countries where the educational policy target is expressed in terms of the proportion of children enrolled in schools. For instance, the target for achieving universal compulsory primary education or for providing 9 years basic education for all children is expressed in terms of the number of children in a specified age range (e.g., 7-13 years for primary);

(b) For preschool education or for post-school education at the tertiary level, the transition from one grade to another is not distinctly laid down as for primary and secondary school education. For instance, a child may enter kindergarten at the age of 4 into the first grade or the age of 5 into the second grade. For courses for technicians, the new students may be high school graduates, or graduates of craft level courses. The enrollment ratio method becomes a better approach to be adopted for making forecasts of enrollment;

(c) As will be demonstrated below, even in cases where the flow model is adopted, the enrollment ratio method has to be used to estimate the number of children entering grade 1 in primary schools;

(d) For systems which are undergoing rapid changes, the historical flow rates may not be replicated in the future. For example, if entry into junior high school is highly selective, it is probable that the promotion rate from junior high school to senior high school is fairly high. When the selection process is shifted from junior high to senior high school level, as a result of the universalization of junior high school education, there will be a wider ability mix among pupils admitted into junior high schools. If the selection criteria for entry into senior high schools remain unchanged, then the promotion rate from junior high to senior high schools will decrease. In such cases, the enrollment ratio method has to be employed either to replace or to adjust the forecasts derived from a flow model based on extrapolating from past flow rates.

## 9.2 Forecasting Using the Flow Model

9.2.1 Grade Retention Model. A number of parameters have to be determined in making use of the grade retention model:

(a) The grade retention rates for the forecast period;

(b) The rates of admission into the first grade of the cycle of education under study over the forecast period, expressed as percentages of either the number of children in the relevant school-age group or the number of children in the relevant school-age group or the number of school leavers from the terminal grade of the preceding cycle of education.

These rates may be estimated by extrapolating from past trends, or based on prescribed policy objectives and/or educational development programmes.

9.2.2 It follows from above that the data required for the projection are as follows:

(a) Historical data on the number of enrollment by grade to permit an analysis of the changes in the grade transition rates over time;

(b) Historical data on the number of children in the age group corresponding to the age of entry into the first grade of the cycle of education under study and/or the number of school leavers from the terminal grade of the preceding cycle of education;

(c) A projection of the number of children in the age group corresponding to the age of entry into the first grade of the cycle of education under study and/or the number of school leavers from the terminal grade of the preceding cycle of education.

9.2.3 Grade Transition Model. The additional feature a grade transition model has over the grade retention model is the distinction made in the former model between repetition and dropouts. Thus in the grade transition model the retention rate between any two grades is decomposed into promotion, dropout and repetition rates. As a result, the model is more sophisticated than the grade retention model in analysing as well as projecting pupil flow. The parameters required for the model are as follows:

(a) The rates of repetition and dropout by grade for the forecast period;

(b) The rates of admission into the first grade of the cycle of education under study over the forecast period, expressed as percentages of either the number of children in the relevant school-age group or the number of school leavers from the terminal grade of the preceding cycle of education.

9.2.4 There are different ways of projecting the above parameters. The following only represent one of the possible approaches which can be adopted:

(a) The rates of repetition are usually prescribed by policymakers as educational targets. Sometimes, the repetition rates are even laid down as part of the regulations governing the modus operandi of schools. For some places, the abolition of repetition, to be replaced by a more pupil oriented approach backed up by a host of remedial education services is regarded as the medium, if not long-term objective in educational planning. Thus, determining the rates of repetition to be used in the forecasting model should be fairly straight-forward. Of course, due allowance must be made for a gradual transition from the existing rates to the target rates;

(b) Dropout is always regarded as undesirable and has to be eliminated from a school system. However, the fact that it is almost practically not possible to prevent pupils from occasional truancy and eventually dropping out from schools, necessitates a realistic assessment of dropout and its inclusion into the projection model. In most cases, the rates of dropouts have to be projected by extrapolating from past trends, modified by expert judgment on the working of the school system;

(c) Projecting new entrants into the school system is the most problematic part of any projection exercise. For entrants into the first level of education (i.e., primary), the age of entry is usually laid down by policymakers. Therefore, it would be fairly straight forward to relate to the number of children in the respective age group to the official education policy governing the proportion of children in the age group who should be admitted into schools. However, two problems generally arise:

(1) Not all children enter primary school at the right age, a phenomenon not uncommon in many developing countries;

(2) Not all children who are required to be admitted in schools would attend schools. Even if they do

turn up at the beginning of the school year, some of them may disappear from school even before schools complete their registration procedure.

(d) To tackle the problem raised in (c)(1) above. One can obtain an estimate of the number of new entrants in different age groups. This entails the projection of the "age-specific" admission rate into grade 1 for each year group in the age range of the new pupils admitted. More detailed statistics on enrollment and new pupils have to be collated:

(1) Historical data on enrollment in grade 1 by age and repeaters in grade 1 by age. The number of new pupils admitted into grade 1 by age can be estimated deducting from the number of grade 1 pupils in a given year group the number of repeaters in the corresponding year group; OR

(2) Historical data on the number of new pupils admitted into grade 1 by age.

The additional statistical information permits an analysis be made of the age-specific admission rate for grade 1. One may extrapolate these rates to forecast the future age-specific admission rates, and multiplying the projected rates by the estimated future population in the respective age group gives the estimated number of new pupils admitted into grade 1 by age. A simple example is given below:

Figure XVI: Estimation of Grade I Entrants

| Yr. Group | Population | Age-specific Admission Rates | Estimated Enrollment |
|---|---|---|---|
| 7 | 100,000 | 0.78 | 78,000 |
| 8 | 110,000 | 0.11 | 12,100 |
| 9 | 113,000 | 0.06 | 6,780 |
| 10 | 115,000 | 0.02 | 2,300 |
| | | Total | 99,180 |

(e) In performing the above statistical analysis, it should be noted that the age-specific admission rates for different year groups are related to each other. This may be illustrated by computing the so-called "diagonal sum" for grade 1 admission, as shown below:

Figure XVII: Diagonal Sum for Grade 1 Admission

| | | |
|---|---|---|
| (i) | Cohort of children aged 7 in yr. 1 | 1000 |
| (ii) | Number of new pupils admitted into grade 1 by age: | |
| | (1) aged 7 in yr. 1 | 800 |
| | (2) aged 8 in yr. 2 | 100 |
| | (3) aged 9 in yr. 3 | 40 |
| | (4) aged 10 in yr. 4 | 20 |
| | Total number in the cohort admitted to grade 1 in yr. 1 - yr. 4 (Diagonal Sum) | 960 |

The diagonal sum derived from the above computation should not be larger than the total number of children in the cohort in question (i.e., 1000). This maxima provides a means of checking the validity of the projected age-specific admission rates.

(f) For places where underreporting of repetition in grade 1 is believed to not be serious, the "diagonal sum" method can be used to provide an indication of the extent of underreporting, the so-called "hidden" repetition in grade 1. Underreporting will mostly occur when pupils transfer from one school to another and repeat grade 1. If the parents of the pupils transferring schools report that the pupils are new entrants rather than repeaters. This phenomena is more widespread when entry to some primary schools are highly selective. As a result, some parents may try to prepare their children for entry into these primary schools by first enrolling them in grade 1 in less selective schools. If the diagonal sum is greater than 1, say 120%, then it may be deduced that the "hidden" rate is 20% over the period concerned. If there is "hidden" repetition, the maxima imposed on the age-specific admission rates to grade 1 will be greater than unity. By forecasting the future movement of the "diagonal sum," one can allow for "hidden" repetition in the projection of new entrants. Doing this is, however, a precarious exercise for several reasons:

(1) The extent of underreporting may change over time as a result of changing admission criteria adopted by schools. It is extremely difficult to predict accuracy future values of the "diagonal sum";

(2) To compute "diagonal sum" requires a fairly long time series on statistics on new pupils admitted into grade 1 by age. The statistics are usually not available for many countries;

(3) The reporting of age by pupils may not be reliable. Besides, accurate demographic statistics on the number of children by single year of age may also not be available, except perhaps for the census year. The computed "diagonal sum" will be subject to all these random errors. As a result, it becomes almost impossible to predict what will be the future values of the "diagonal sum" based on an analysis of the past trend.

Therefore extreme care needs to be exercised in the use of the "diagonal sum" method in the projection model.

(g) For estimating entrants from one cycle to another, from primary into the first cycle of the second level of education (i.e., junior high school), the parameters are the number of school leavers from primary schools and the rate of admission. Estimates of the number of school leavers are the output from the flow model for the primary schools. The rate of admission into junior high school is normally governed by education policy and the availability of places in junior high schools. For countries where the private sector is not insignificant, the actual rates of admission into junior high schools will be to some extent beyond the control of educational planners and administrators. The number of primary school leavers who choose to enter junior high schools in the private sector will depend on such factors as the quality of places available in the private sector, the school fees charged, and the "return" they could expect from attending junior high schools in the private sector. In situations where both the public sector provision is expanding and people's aspirations for more education is also rising, it would be quite difficult to predict what the future admission rates would be.

## 9.3 The Choice of Methodology

9.3.1 Apparently, the flow model is the more sophisticated model compared with a simple time series analysis of enrollment or the enrollment ratio method. However, this does not mean that the flow model is superior to the other two methods in projecting enrollment. Wherever possible, one has to construct a flow model in order to understand the dynamics of pupil flow in the school system. Additionally, one needs to look at the enrollment ratio to appraise the effectiveness of a program of providing education to the children in reaching its target population. A simple time series analysis of enrollment will provide one with an idea of how enrollment is changing over time, with its

consequential impact on teacher requirement, the demand for school facilities, etc. Which one of the three methods should be chosen would depend on the outcome of the analysis and the educational program in question.

9.3.2 It is very difficult to generalize the applicability of different projection models. The following attempt to give some general guideline:

(a) For cases where:

(1) the total enrollment accounts for a small proportion of children in the relevant school-age group, or
(2) where the ages of pupils enrolled cannot be clearly defined, or
(3) there are different kinds of educational provisions for a given age group,

The use of the time series method for projecting enrollment can be adopted. These would cover the projection of enrollment in a specified course of tertiary education and the projection of enrollment in evening courses for adults;

(b) The flow model has more practical utility in planning than the enrollment ratio method. This is because a projection of enrollment by grade including the number of school leavers from a given cycle of education can only be obtained by using the flow model. This kind of information is essential to planners in tackling problems of selection and allocation in the education system. Similar information can only be made available by using the enrollment ratio method if the number of over-aged or under-aged pupils in the school system is insignificant, which is seldom to be the case in many countries;

(c) Nevertheless, it is recommended to use both the enrollment ratio method and the flow model wherever possible in projecting enrollment. The enrollment ratio method can provide a check on how realistic are the results obtained from a flow model. In circumstances where the flow rates do not display a stable trend over time, probably as a result of rapid development in a certain sector of the education system, the enrollment ratio method could be used as a countercheck on the validity of the assumptions made regarding future movement of the flow rates.

## 10. User Manual

### 10.1 Getting Started

10.1.1 In this Unit, the participants will be introduced to the techniques in constructing a more complicated worksheet, using the formatting commands as well as a few new commands not discussed in Unit 1. An enrollment projection worksheet has already been developed for this unit, and is stored in the file named PUPROJ in the Diskette "EPP Mod.v.5." Most parts of the worksheet are protected against modification. Only the policy variables such as admission rates, repetition rates, etc., are allowed to be modified.

### 10.2 The Grade Transition Model

10.2.1 It is considered sufficient to demonstrate the development and use of the grade transition model in a LOTUS worksheet. Once the participants have mastered the techniques in developing a grade transition model, there should be little difficulty for them to develop other less complicated models such as the grade retention model or the enrollment ratio method in projecting enrollment.

10.2.2 Projecting Admission. The grade transition model contained in the worksheet named PUPROJ is a model for projecting enrollment in primary schools. The first part of the model is the projection of new pupils admitted into grade 1 in primary schools. The enrollment ratio method is employed in the enrollment, by extrapolating the future grade specific gross enrollment rates, defined as the ratio of new pupils admitted to primary schools to the number of children in the relevant school age group (i.e., 7 years). The following functions are provided in the projection model:

(a) Users are allowed to prescribe a target gross enrollment rate for the year 2000;

(b) Then the worksheets are programmed so that the gross enrollment rate will gradually move towards the target, following a linear trend;

(c) The estimated numbers of children in the 7 year group for the forecast period from 1985 to 2000 are given in the model as exogenous variables;

(d) The number of new pupils admitted into grade 1 in primary schools can thus be computed from the product of the gross enrollment ratio and the population aged 7 years.

The relevant part of the worksheet PUPROJ is shown in the diagram below:

Figure XVIII: Grade 1 Admission in PUPROJ

Forecasting and Planning Model

(I) Primary Enrollment Projection Flow Model

Estimated gross enrollment ratio for year

2000 100.0%

| Year | Population Aged 7 years | Gross Enrollment Ratio | No. of New Entrants | I |
|---|---|---|---|---|
| 1984 (actual) | 4,324,000 | 103.4% | 4,470,807 | 5382689 / 871996 |
| 1985 | 4,342,000 | 103.2% | 4,480,204 | 5352200 / 829591 |
| 1986 | 4,349,000 | 103.0% | 4,478,199 | 5307790 / 785553 |
| 1987 | 4,354,000 | 102.8% | 4,474,108 | 5259661 / 741612 |
| 1988 | 4,398,000 | 102.5% | 4,509,990 | 5251602 / 703715 |
| 1989 | 4,436,000 | 102.3% | 4,539,544 | 5243259 / 665894 |

10.2.3 Projecting Repetition. The second step one has to do is to forecast the rate of repetition. Several functions have been built into the worksheet to project the rates of repetition by grade:

(a) Users are allowed to assign the target rates of repetition for each of the six grades for the year 2000;

(b) From the actual rates of repetition in 1984 and the targets in 2000, the system will extrapolate the rates for 1985-2000 assuming a linear trend.

The results are shown in the diagram below:

Figure XIX: Repetition Rates in PUPROJ

| Target for yr. | Repetition rates | | | | | |
|---|---|---|---|---|---|---|
| 2000 | 5.0% | 5.0% | 4.0% | 3.0% | 3.0% | 2.0% |
| | | | Grade | | | |
| Yr. | I | II | III | IV | V | VI |
| 1984 | 16.2% | 12.9% | 10.5% | 8.0% | 9.7% | 2.0% |
| 1985 | 15.5% | 12.4% | 10.1% | 7.7% | 9.3% | 2.0% |
| 1986 | 14.8% | 11.9% | 9.7% | 7.4% | 8.9% | 2.0% |
| 1987 | 14.1% | 11.4% | 9.3% | 7.1% | 8.4% | 2.0% |
| 1988 | 13.4% | 10.9% | 8.9% | 6.8% | 8.0% | 2.0% |
| 1989 | 12.7% | 10.4% | 8.5% | 6.4% | 7.6% | 2.0% |
| 1990 | 12.0% | 9.9% | 8.1% | 6.1% | 7.2% | 2.0% |
| 1991 | 11.3% | 9.4% | 7.7% | 5.8% | 6.8% | 2.0% |
| 1992 | 10.6% | 9.0% | 7.3% | 5.5% | 6.4% | 2.0% |
| 1993 | 9.9% | 8.5% | 6.8% | 5.2% | 5.9% | 2.0% |
| 1994 | 9.2% | 8.0% | 6.4% | 4.9% | 5.5% | 2.0% |
| 1995 | 8.5% | 7.5% | 6.0% | 4.6% | 5.1% | 2.0% |
| 1996 | 7.8% | 7.0% | 5.6% | 4.2% | 4.7% | 2.0% |
| 1997 | 7.1% | 6.5% | 5.2% | 3.9% | 4.3% | 2.0% |
| 1998 | 6.4% | 6.0% | 4.8% | 3.6% | 3.8% | 2.0% |
| 1999 | 5.7% | 5.5% | 4.4% | 3.3% | 3.4% | 2.0% |
| 2000 | 5.0% | 5.0% | 4.0% | 3.0% | 3.0% | 2.0% |

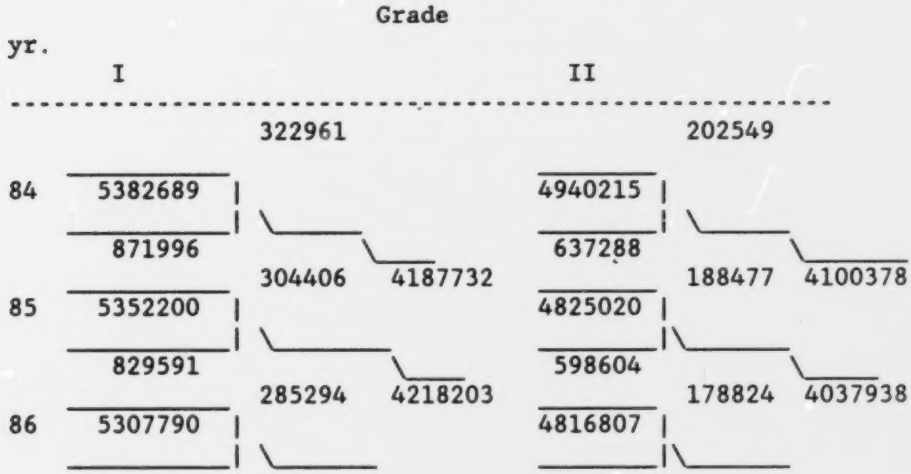
10.2.4 Projecting Dropout Rates. Similar technique is employed in projecting the dropout rates, by allowing users to assign the target years for the year 2000. The results are shown in the worksheet below:

Figure XX: Dropout Rates in PUPROJ

| Target for yr. | Dropout Rates | | | | | |
|---|---|---|---|---|---|---|
| 2000 | 1.0% | 1.0% | 1.0% | 1.0% | 1.0% | 1.0% |
| | Grade | | | | | |
| Yr. | I | II | III | IV | V | VI |
| 1984 | 6.0% | 4.1% | 5.0% | 3.1% | 3.0% | 3.0% |
| 1985 | 5.7% | 3.9% | 4.8% | 3.0% | 2.9% | 2.9% |
| 1986 | 5.4% | 3.7% | 4.5% | 2.8% | 2.8% | 2.8% |
| 1987 | 5.1% | 3.5% | 4.3% | 2.7% | 2.6% | 2.6% |
| 1988 | 4.7% | 3.3% | 4.0% | 2.6% | 2.5% | 2.5% |
| 1989 | 4.4% | 3.1% | 3.7% | 2.4% | 2.4% | 2.4% |
| 1990 | 4.1% | 2.9% | 3.5% | 2.3% | 2.2% | 2.2% |
| 1991 | 3.8% | 2.7% | 3.2% | 2.2% | 2.1% | 2.1% |
| 1992 | 3.5% | 2.5% | 3.0% | 2.0% | 2.0% | 2.0% |
| 1993 | 3.2% | 2.4% | 2.7% | 1.9% | 1.9% | 1.9% |
| 1994 | 2.9% | 2.2% | 2.5% | 1.8% | 1.7% | 1.7% |
| 1995 | 2.6% | 2.0% | 2.2% | 1.7% | 1.6% | 1.6% |
| 1996 | 2.2% | 1.8% | 2.0% | 1.5% | 1.5% | 1.5% |
| 1997 | 1.9% | 1.6% | 1.7% | 1.4% | 1.4% | 1.4% |
| 1998 | 1.6% | 1.4% | 1.5% | 1.3% | 1.2% | 1.2% |
| 1999 | 1.3% | 1.2% | 1.2% | 1.1% | 1.1% | 1.1% |
| 2000 | 1.0% | 1.0% | 1.0% | 1.0% | 1.0% | 1.0% |

10.2.5 Projecting the Flow. After all the input parameters (i.e., admission, repetition and dropout rates) have been estimated, the next step is to go to the flow model to project the number of pupils, repeaters and dropouts. The working of the grade transition model is similar to the one examined in Unit 1. In Unit 1, we are computing the flow rates from enrollment and repeater statistics; but in this unit, we will be computing enrollment, dropout and repeater figures from the flow rates. The following diagram depicts part of the flow model used in the PUPROJ worksheet:

Figure XXI: Flow Model in PUPROJ




There are four sets of figures in the above diagram:

(a) The figures shown inside the boxes above are the estimated enrollment. Therefore the estimated enrollment for grade 1 in 1986 is 5307790;

(b) The figures shown at the upper right hand corner of the boxes are the estimated numbers of dropouts. Thus, the number of dropouts between grade 1 and grade 2 for 1985-1986 is 304406;

(c) The figures given at the bottom of the boxes are the numbers of repeaters. For the number of repeaters in grade 1 in 1984 is 871996;

(d) The figures given at the top left corners of the boxes are the number of pupils promoted. It may be seen from the above diagram that the number of pupils promoted from grade 1 in 1985 to grade 2 in 1986 is 4218203.

10.3 Formulae for Computations

10.3.1 The interrelationship between the four sets of figures and with the admission, dropout and repetition rates estimated in other parts of the worksheet is defined in a similar manner as that for the grade transition model discussed in Unit 1 above:

(a) Grade 2 - 6 Enrollment. The number of enrollment in grade 2 in 1986 (i.e., 4825020) is equal to SUM of the number of repeaters in grade 2 in 1986 which is 637288

and the number of pupils promoted from grade 1 to grade 2 in 1986 (i.e., 4187732);

(b) Number of Pupils Promoted. The number of pupils promoted from grade 1 to grade 2 in 1986 is in turn given by the total number of pupils in grade 1 in 1985 (i.e., 5382699) LESS the number of pupils who repeated grade 1 in 1986 (i.e., 871396) AND the number of pupils who dropped out from grade 1 in 1985-86 (i.e., 322961).

10.3.2 The number of repeaters, dropouts and enrollment in grade 1 are estimated by linking other parts of the worksheet on repetition and dropout rates and the number of new pupils admitted. The relationships between them are described below:

(a) Grade 1 Enrollment. This is given by adding the number of new pupils admitted to grade 1 to the number of repeaters in grade 1 for the year concerned;

(b) Number of Repeaters. The number of repeaters for grade 1 in 1987 is derived from multiplying the enrollment in 1986 by the estimated repetition rate in grade 1 in 1987;

(c) Number of Dropouts. The number of dropouts between grade 2 and grade 3 in 1986-87 is given by multiplying the enrollment in grade 2 in 1986 by the estimated dropout rate for grade 1 to grade 2 for 1986-87.

## 10.4 Constructing the LOTUS Worksheet

10.4.1 Entering Labels and Numbers. After having defined the interrelationship between the various parameters, the next step is to develop the worksheet. For a large worksheet like the grade transition model, it would be a fairly time-consuming exercise to enter all the labels, including the flow diagram, and numbers into the worksheet. The participants may make use of the COPY command learned in Unit 1 to simplify their task. In order to design a format like that of PUPROJ, the participants will have to resort to the various format commands which have been examined in Unit 1 above.

10.4.2 Defining Formulae. Formulae have to be entered into the worksheet for calculating the number of dropouts, the number of repeaters, etc. Different techniques have been been used:

(a) Relative Addressing. This is the default setting for formulae in the worksheet. Thus, it is only necessary to enter the formula for one year or one grade for

computing the number of repeaters. The formula for the repeaters in grade 1 in 1985 can be created by:

(1) First move the cursor key to the cell which will contain the number of repeaters in grade 1 in 1985;

(2) Type [+] to tell the system that a formula is being entered;

(3) Move the cursor key to the cell which contains the value for the number of pupils in grade 1 in 1984;

(4) The address of the cell will appear on the control panel at the top of the worksheet;

(5) Then type [*] which represents the multiplication operator. The cursor will immediately jump back to the cell which will store the result of the calculation (i.e., the number of repeaters in grade 1 in 1985);

(6) Then move the cursor to the cell which contains the repetition rate for grade 1 in 1985. Then press [ENTER]:

(7) The cursor will return back to the cell which will store the result of the formula (enrollment in grade 1 in 1985 multiplied by the repetition rate in grade 1 in 1986). The formula expressed in terms of the relevant cell addresses and the multiplication operator will also appear on the control panel at the top of the worksheet.

As cell addresses in the worksheet are relative, the formula just created for calculating the number of repeaters in grade 1 in 1986 can be copied to calculate the numbers of repeaters in grade 1 in 1987-2000, as well as in grades 2-6 for the whole forecast period. This COPY technique has been demonstrated in Unit 1. Using the same technique, the formulae for computing the number of enrollments by grade, the number of dropouts and the number of new pupils admitted can be entered into the worksheet easily.

(b) Mixed Cell Addressing. The technique of mixed cell addressing has been used to create formulae for estimating the admission, repetition and dropout rates. Cell addresses in formula can be relative, absolute and mixed. When absolute addressing is used, the cell address, say C10, will be written as $C$10. No matter where this formula is copied to, the cell address

remains unchanged. Mixed cell addressing is either keeping the column (represented by $C10) or the row address (represented by C$10) constant. The "$" sign may be entered into the formula by using the editing key [F2]. Alternatively, before the formula has been completed, the cell reference can be transformed into absolute form using the function key [F4]. Pressing [F4] once will change from relative to absolute addressing. Pressing [F4] again will give a mixed cell addressing with the row address becoming "absolute." Pressing [F4] once more will give a mixed cell addressing with the column becoming "absolute." "Mixed cell" addressing is required because the grade 1 gross enrollment ratios, the rates of repetition and dropouts are based on the target rates set for a specified target year. With "mixed cell" addressing, copying of formulae for these rates would not change the cell addresses for the target rates.

(c) @MAX Function. This function is used in projecting the grade 1 gross enrollment ratio to ensure that the ratio would not fall below unity. The function @MAX (list) returns the maximum value in the list.

10.4.3 It is suggested that the participants should explore the worksheet and examine the formulae displayed on the control panel at the top of the worksheet, in order to have a better understanding of how the worksheet is built up.

10.4.4 The results of the projection are summarized the far right end of the worksheet. To summarize the results provides a convenient means of making use of the results of the projection of further analysis. The results are also reproduced below:

Figure XXII: Results of the Enrollment Projection

| Year | Projected Enrollment for Grade I-IV | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| 1984 | 5,382,689 | 4,940,215 | 4,612,349 | 4,209,870 |
| 1985 | 5,352,200 | 4,825,020 | 4,584,675 | 4,234,225 |
| 1986 | 5,307,790 | 4,816,807 | 4,500,704 | 4,229,643 |
| 1987 | 5,259,661 | 4,810,745 | 4,500,186 | 4,354,000 |
| 1988 | 5,251,602 | 4,801,106 | 4,509,814 | 4,186,051 |
| 1989 | 5,243,259 | 4,822,957 | 4,517,194 | 4,211,734 |
| 1990 | 5,215,428 | 4,847,790 | 4,551,393 | 4,236,380 |
| 1991 | 5,181,219 | 4,856,189 | 4,590,593 | 4,284,617 |
| 1992 | 5,137,462 | 4,856,813 | 4,615,809 | 4,338,975 |
| 1993 | 5,168,245 | 4,847,764 | 4,632,926 | 4,381,332 |
| 1994 | 5,198,579 | 4,901,790 | 4,640,666 | 4,415,736 |
| 1995 | 5,155,372 | 4,961,156 | 4,704,227 | 4,441,173 |
| 1996 | 5,105,489 | 4,955,595 | 4,776,671 | 4,517,286 |
| 1997 | 5,055,690 | 4,938,040 | 4,790,668 | 4,604,434 |
| 1998 | 5,006,595 | 4,918,928 | 4,789,923 | 4,638,118 |
| 1999 | 4,958,243 | 4,899,331 | 4,786,580 | 4,655,691 |
| 2000 | 4,910,620 | 4,879,703 | 4,782,597 | 4,670,059 |

## 11. Learning Activities

### 11.1 Microcomputer Tutorial Session

11.1.1 The purpose of this tutorial session is to provide an opportunity for the participants to see how the worksheet can be used to answer the "what if" question in planning. Figures in the worksheet PUPROJ have been protected against modifications except for the following parameters:

(a) The projection population aged 7 years for the entire forecast period;

(b) The target grade 1 gross enrollment ratio and the target year for the target ratio to be reached;

(c) The target rates of repetition by grade and the target year for these rates to be attained;

(d) The target rates of dropout by grade and the target year for which these rates could be achieved;

(e) The actual enrollment, rates of repetition and dropouts and the grade 1 gross enrollment rate for the year 1984;

11.1.2 The global protection and the unprotection for specified range of cells can be set by the following commands:

(a) Setting global protection
  (1) [/] to bring up the LOTUS menu;
  (2) [W] to open the worksheet menu;
  (3) [G] to select the global menu;
  (4) [P] to select the protection facility and the [E]nable command;

(b) Unprotect range of cells
  (1) The cell addresses for the parameters listed in paragraph 11.1.1 above are unprotected by using the command [/] to bring up the LOTUS menu;
  (2) [R] to select the range menu;
  (3) [U] to activate the unprotect facility. By specifying the range of cells to be unprotected, followed by [RETURN], this allows values in the cells specified to be modified.

11.1.3 The participants could assign different values to the parameters listed in paragraph 11.1.1 above. By pressing [F9], a new set of projection different from the one shown in Figure XXII above can be obtained from the worksheet. The participants are encouraged to practice by assigning different sets of values to these parameters.

12. Post-assessment

12.1 The participants are asked to develop, by their own, a projection model using the grade retention model for primary schools with the following statistical information:

(a) The estimated number of population aged 7 for the years 1984-2000 which is given in the worksheet PUPROJ;

(b) The estimated number of population aged 8 for the years 1984-2000 which is assumed to be the same as the number of children aged 7 years;

(c) The age-specific enrollment ratio for grade 1 in 1984 and the target year of 2000:

| | Age 7 | Age 8 |
|---|---|---|
| 1984 (actual) | 68% | 20% |
| 2000 (target) | 90% | 10% |

It is assumed that pupils admitted into grade 1 are all within the age range from 7 to 8 years;

(d) The target and actual retention rates by grades:

| Gr. | 1-2 | 2-3 | 3-4 | 4-5 | 5-6 |
|---|---|---|---|---|---|
| 1984 (actual) | 88% | 90% | 95% | 85% | 70% |
| 2000 (target) | 100% | 100% | 100% | 95% | 90% |

(e) The actual enrollment in 1984 is the same as that given in the worksheet PUPROJ.

The participants will have to construct the worksheet based on the above statistical information.

## IV. Unit 3: Projection of Teacher and Other Resources Requirements An Integrated Approach

13. Performance Objectives

13.1 The basic techniques used in constructing a fairly completed projection have been discussed in Unit 2. In this unit, the participants will be introduced to the techniques of linking different projections in a single worksheet. On completion of this unit, the participants should be able to:

(a) Appreciate the interrelationship between the enrollment projection and other resources requirements like the teacher requirement projection and the projection of additional schools required;

(b) Combine different LOTUS spreadsheets into an integrated projection model, encompassing enrollment projection and other resources requirement projection models.

14. Instructional Activities

14.1 This is a fairly short unit, as the basic techniques in using LOTUS 123 to develop projection models have already been discussed in Unit 2 above. Furthermore, the projection of teacher requirements and other resources implications are relatively less complicated than the enrollment projection models. In this unit, the instructors should emphasize the need to link these different projections together in planning, so that an overall implication of a given education policy can be thoroughly examined.

14.2 Teacher Projection

14.2.1 Teacher Projection is compared with other forecasts of manpower requirement, relatively easy to undertake. This is because of the number of teachers required for a given enrollment size is largely determined by educational planners and policymakers. Furthermore, substitutability is not easy as many countries enforce a certain standard on teacher recruitment. Nevertheless, it is not uncommon to find countries having to cope with the problems of shortages or surpluses in the supply of teachers.

14.2.2 There are two main parameters in forecasting teacher requirements:

(a) The teacher/class ratio or the pupil/teacher ratio;

(b) The teacher wastage rate.

If it is required to project the number of teacher required by qualifications, then additional information is required on the qualification structure of the teacher force.

14.3 Projection of Other Resources Requirements

14.3.1 There is a host of other resources requirements that have to be taken into account in preparing an education plan. These include, for instance, the following:

(a) The additional number of classrooms and the number of schools required;

(b) The number of textbooks required and the number of library books required;

(c) The TV sets required for educational television;

(d) The number of school social workers/counsellors required.

Usually, these requirements can be related directly to the enrollment size.

14.3.2 Finally, it goes without saying that it is necessary to estimate as well the total costs required, which may be broken down into teacher salary costs, and other recurrent costs as well as nonrecurrent costs.

## 15. User Manual

15.1 Two worksheets on teacher requirement projection and requirement for an additional number of classes have been developed for this unit. They are stored in the file TEPROJ and CLPROJ respectively. The techniques used in developing these two worksheets have already been discussed in Units 1 and 2 above. A third worksheet which combines the three worksheets PUPROJ, TEPROJ and CLPROJ has also been created. This worksheet represents an integrated approach to forecasting. The worksheet is stored in the file named PLAN.

### 15.2 TEPROJ Worksheet for Teacher Requirements Projection

15.2.1 It is not proposed to go through the steps involved in developing this worksheet. The participants should by now be able to develop a worksheet like TEPROJ. Therefore, only the main feature of the worksheet will be discussed here. The worksheet can be divided into two parts:

(a) The first part is the use of the pupil/teacher ratio to estimate the total number of teachers, given a forecast of enrollment. The relevant part of the worksheet is shown below:

Figure XXIII: Estimating Total Number of Teachers Required

Teacher Requirement Projection Model II.
Projected Teacher Requirement

| Year | Total Enrollment | Pupil/teacher ratio | Number of Teachers Required |
|---|---|---|---|
| 1984 | 26,567,688 | 32.00 | 830,240 |
| 1985 | 26,612,007 | 31.94 | 833,253 |
| 1986 | 26,712,188 | 31.88 | 838,029 |
| 1987 | 26,847,231 | 31.81 | 843,921 |
| 1988 | 26,647,526 | 31.75 | 839,292 |
| 1989 | 26,681,691 | 31.69 | 842,026 |
| 1990 | 26,792,066 | 31.63 | 847,180 |
| 1991 | 26,925,462 | 31.56 | 853,084 |
| 1992 | 27,056,442 | 31.50 | 858,935 |
| 1993 | 27,259,670 | 31.44 | 867,107 |
| 1994 | 27,500,230 | 31.38 | 876,501 |
| 1995 | 27,701,963 | 31.31 | 884,693 |
| 1996 | 27,875,371 | 31.25 | 892,012 |
| 1997 | 28,028,508 | 31.19 | 898,710 |
| 1998 | 28,170,038 | 31.13 | 905,061 |
| 1999 | 28,256,614 | 31.06 | 909,670 |
| 2000 | 28,275,353 | 31.00 | 912,108 |

Thus the total number of teachers required is obtained by simply dividing the total enrollment by the pupil/teacher ratio.

(b) The second part of the worksheet is the estimation of the number of new teachers required to cope with the increase in the number of teachers and to replace wastage. The relevant part of the worksheet is as follows:

Figure XXIV: Projecting Additional No. of Teachers

| | Additional Number of New Teachers Required for Replacement | for Increased Demand | Total |
|---|---|---|---|
| 1985 | 58,117 | 3,012 | 61,129 |
| 1986 | 58,328 | 4,777 | 63,104 |
| 1987 | 58,662 | 5,891 | 64,553 |
| 1988 | 59,074 | (4,629) | 54,446 |
| 1989 | 58,750 | 2,734 | 61,484 |
| 1990 | 58,942 | 5,154 | 64,096 |
| 1991 | 59,303 | 5,904 | 65,207 |
| 1992 | 59,716 | 5,851 | 65,567 |
| 1993 | 60,125 | 8,172 | 68,298 |
| 1994 | 60,697 | 9,395 | 70,092 |
| 1995 | 61,355 | 8,192 | 69,547 |
| 1996 | 61,929 | 7,318 | 69,247 |
| 1997 | 62,441 | 6,698 | 69,139 |
| 1998 | 62,910 | 6,352 | 69,261 |
| 1999 | 63,354 | 4,608 | 67,962 |
| 2000 | 63,677 | 2,439 | 66,115 |

The number of new teachers required to meet replacement demand can be estimated by applying the assumed waste rate to the number of teachers in the preceding year.

## 15.3 CLPROJ Worksheet for Estimated Number of Classes

15.3.1 The CLPROJ is developed to illustrate how the results of the enrollment projection can be used to estimate the number of additional classes required. The worksheet is reproduced below:

Figure XXV: CLPROJ Worksheet

II. Projected Number of Operating Classes Required

| Year | I | II | III | IV |
|---|---|---|---|---|
| Assumptions on class size: | 45.0 | 44.0 | 43.0 | 43.0 |
| 1984 | 119,615 | 112,278 | 107,264 | 97,904 |
| 1985 | 118,938 | 109,660 | 106,620 | 98,470 |
| 1986 | 117,951 | 109,473 | 104,668 | 98,364 |
| 1987 | 116,881 | 109,335 | 104,655 | 101,256 |
| 1988 | 116,702 | 109,116 | 104,879 | 97,350 |
| 1989 | 116,517 | 109,613 | 105,051 | 97,947 |
| 1990 | 115,898 | 110,177 | 105,846 | 98,520 |
| 1991 | 115,138 | 110,368 | 106,758 | 99,642 |
| 1992 | 114,166 | 110,382 | 107,344 | 100,906 |
| 1993 | 114,850 | 110,176 | 107,742 | 101,891 |
| 1994 | 115,524 | 111,404 | 107,922 | 102,692 |
| 1995 | 114,564 | 112,754 | 109,401 | 103,283 |
| 1996 | 113,455 | 112,627 | 111,085 | 105,053 |
| 1997 | 112,349 | 112,228 | 111,411 | 107,080 |
| 1998 | 111,258 | 111,792 | 111,394 | 107,863 |
| 1999 | 110,183 | 111,348 | 111,316 | 108,272 |
| 2000 | 109,125 | 110,902 | 111,223 | 108,606 |

It may be noted that the only parameters used in the previous projection is the average class size by grade.

## 15.4 Integrated Projection Model

15.4.1 An integrated projection model has been developed by combining the PUPROJ, TEPROJ, and CLPROJ worksheets. An additional feature has also been included in the integrated model. This is the estimation of the number of new schools required, based on an assumption of the average number of operating classes per new school. The relevant worksheet is shown below:

Figure XXVI: Projecting School Requirement in PLAN

(IV) Projected Number of Schools Required

Average No. of classes/new school - 12

| Total Num. of classes | Additional no. of classes required | Additional no. of schools required | No. of New schools required each year |
|---|---|---|---|
| 609,679 | (cumulative) | (cumulative) | |
| 610,802 | 1,123 | 94 | 94 |
| 613,182 | 3,503 | 292 | 198 |
| 616,375 | 6,697 | 558 | 266 |
| 611,744 | 2,066 | 172 | (386) |
| 612,536 | 2,857 | 238 | 66 |
| 615,118 | 5,440 | 453 | 215 |
| 618,252 | 8,573 | 714 | 261 |
| 621,343 | 11,664 | 972 | 258 |
| 626,042 | 16,363 | 1,364 | 392 |
| 631,576 | 21,898 | 1,825 | 461 |
| 636,281 | 26,602 | 2,217 | 392 |
| 640,368 | 30,690 | 2,557 | 341 |
| 643,990 | 34,312 | 2,859 | 302 |
| 647,343 | 37,664 | 3,139 | 279 |
| 649,416 | 39,738 | 3,311 | 173 |
| 649,912 | 40,233 | 3,353 | 41 |

16. Learning Activities

16.1 Microcomputer Tutorial Session

16.1.1 The participants are asked to change the following policy variables and press [F9] to see how the projection will be changed:

(a) The target grade 1 gross enrollment ratio;

(b) The target repetition rates;

(c) The target dropout rates;

(d) The target pupil/teacher ratio;

(e) The average class size;

(f) The average number of classes per new school.

17. Post-assessment

17.1 The participants will be asked to:

(a) Develop a worksheet for teacher projection, using the teacher/class ratio instead of the pupil/teacher ratio for projecting teacher requirement. All other variables will be the same as the PLAN worksheet except that teacher/class ratio for the forecast period is assumed to remain constant at 1:4.

(b) Integrate this worksheet with the PUPROJ and CLPROJ worksheets to produce an integrated forecasting model.